CS-200 Diagnostic Workstation

Service Handbook

SCHILLER AG

Altgasse 68

CH-6341 Baar, Switzerland

Phone: + 41 41 766 42 42

Fax: + 41 41 761 08 80

Home page: http://www.schiller.ch/

October 2001 *Article Number: 2.540 013*

CS-200 Service Handbook

Article Number 2. 540013d

Issue 1 : July 1998

Issue 2 : December 1998, corrections in menues and functions based on software version SDS 1.6.

Issue 2.1: December 1999, minor corrections in text, new schematic for ECG interface 2223EA.
Schematics: 2450DA, 2451AA, 2452BA, 2453BA, 2454BC, 2455BA, 2456AA, 2223EA

Issue d : October 2001, minor corrections, introduced CE0123.

Associated Documents

Guide to the SCHILLER Interpretation and Measurement Program E/ D/ F	Article No.	2. 510 179
SCHILLER CS-200 User Guide - German	Article No.	2. 510 211
SCHILLER CS-200 User Guide - English	Article No.	2. 510 212
SCHILLER CS-200 User Guide - French	Article No.	2. 510 213
SCHILLER CS-200 User Guide - Italian	Article No.	2. 510 214
SCHILLER CS-200 User Guide - Spanish	Article No.	2. 510 215
SCHILLER CS-200 User Guide - Portuguese	Article No.	2. 510 216
SCHILLER CS-200 User Guide - Swedish	Article No.	2. 510 217

CE 0123 93/42/EEC Medical Devices:
0123 `Notified Body` TÜV P. S.

© 2001 SCHILLER AG
Windows™ is a trademark of Microsoft Corporation.

Where to Obtain Service

USA / Canada	**WELCH ALLYN SCHILLER Inc.**, 7420 Carroll Road, San Diego, CA , US-92121-2334 USA	
	Tel.: +1 858 635 6023	Fax : +1 858 635 6611
	Home Page : www.welchallyn.com	
Asia Pacific	**SCHILLER Asia Pacific**, 10 Jalan SS 3/33, Taman Universiti, 47300 Petaling Jaya, Selangor, Malaysia	
	Tel.: + 603 7877 5336	Fax : + 603 7877 5744
Austria	**SCHILLER HmbH**, Kampmüllerweg 24, A-4044 Linz, Austria	
	Tel.: + 43 732 709 90	Fax : + 43 732 757 000
France	**SCHILLER Medical S.A,** BP 50, 19, Avenue de la Gare, F-67162 Wissembourg / Cedex, France	
	Tel.: +33 3 88 63 36 00	Fax : +33 3 88 94 12 82
Germany (EU authorized representative)	**SCHILLER Medizintechnik GmbH**, Rudolf-Diesel Strasse 14, D-85521 Ottobrunn, Germany	
	Tel.: + 4989 629 981 0	Fax : + 4989 609 509 0
India	**SCHILLER Healthcare India Pvt. Ltd.**,D.C.Silk Mills Compound, 'A' Wing, 1st floor, 5, Chunawala Estate, Kondivitta Lane, Andheri - Kurla Road, Andheri (E, Mumbai - 400 059, India	
	Tel.: + 9122 826 3520	Fax : + 9122 826 3525
Italy	**ESAOTE Spa (SCHILLER**), Via di Caciolle 15, I-50127 Firenze, Italy	
	Tel.: + 39055 4229 201	Fax : + 39055 4229 208
Switzerland	**SCHILLER Reomed AG**, Riedstrasse 14, CH-8953 Dietikon, Switzerland	
	Tel.: +411 744 3000	Fax : + 411 740 3710
All other countries	**SCHILLER AG**, Altgasse 68, CH-6341 Baar, Switzerland	
	Tel.: + 4141 766 4242	Fax : + 4141 761 0880
	Home Page : www.schiller.ch	

The SCHILLER sales and service centre network is worldwide. For the address of your local distributer, contact your nearest Schiller subsidiary. In case of difficulty a complete list of all distributers and subsidiaries is provided on our internet site or can be supplied from our head office.

Warranty

Terms of Warranty

The SCHILLER CS-200 is warranted against defects in material and manufacture for the duration of one year (as from date of purchase). Excluded from this guarantee is damage caused by an accident or as a result of improper handling. The warranty entitles free replacement of the defective part. Any liability for subsequent damage is excluded. The warranty is void if unauthorized or unqualified persons attempt to make repairs.

In case of a defect, contact your dealer or the manufacturer.

The manufacturer can only be held responsible for the safety, reliability, and performance of the apparatus if:

* assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorized by him, and

* the CS-200 and approved attached equipment are used in accordance with the manufacturers instructions.

THERE ARE NO EXPRESS OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREINABOVE SET FORTH. SCHILLER MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCT OR PARTS THEREOF.

Safety Notices

TO PREVENT ELECTRIC SHOCK DO NOT DISASSEMBLE THE UNIT. NO SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL ONLY.

DO NOT USE THIS UNIT IN AREAS WHERE THERE IS ANY DANGER OF EXPLOSION OR THE PRESENCE OF FLAMMABLE GASES SUCH AS ANAESTHETIC AGENTS.

IF THE DISPLAY IS DAMAGED, A LEAKAGE OF FLUID MAY OCCUR. DO NOT INHALE THE VAPOUR FROM THIS FLUID AND AVOID CONTACT WITH MOUTH AND SKIN. IF CONTACT IS MADE, CLEAN CONTAMINATED AREA IMMEDIATELY WITH FRESH WATER.

THIS PRODUCT IS NOT DESIGNED FOR STERILE USE.

SWITCH THE UNIT OFF BEFORE CLEANING AND DISCONNECT FROM THE MAINS.

DO NOT, UNDER ANY CIRCUMSTANCES, IMMERSE THE UNIT OR CABLE ASSEMBLIES IN LIQUID.

DO NOT OPERATE THE UNIT IF THE EARTH CONNECTION IS SUSPECT OR IF THE MAINS LEAD IS DAMAGED OR SUSPECTED OF BEING DAMAGED.

DO NOT USE HIGH TEMPERATURE STERILISATION PROCESSES (SUCH AS AUTOCLAVING). DO NOT USE E-BEAM OR GAMMA RADIATION STERILISATION.

DO NOT USE SOLVENT CLEANERS

USE ONLY ACCESSORIES AND OTHER PARTS RECOMMENDED OR SUPPLIED BY SCHILLER AG. USE OF OTHER THAN RECOMMENDED OR SUPPLIED PARTS MAY RESULT IN INJURY INACCURATE INFORMATION AND/ OR DAMAGE TO THE UNIT.

THIS UNIT COMPLIES WITH EMC REGULATIONS FOR MEDICAL PRODUCTS WHICH AFFORDS PROTECTION AGAINST EMISSIONS AND ELECTRICAL INTERFERENCE. HOWEVER SPECIAL CARE MUST BE EXERCISED WHEN THIS UNIT IS USED WITH HIGH FREQUENCY EQUIPMENT.

IT MUST BE ENSURED THAT NEITHER THE PATIENT NOR THE ELECTRODES (INCLUDING THE NEUTRAL ELECTRODE) COME INTO CONTACT WITH OTHER PERSONS OR CONDUCTING OBJECTS (EVEN IF THESE ARE EARTHED).

THERE IS NO DANGER WHEN USING THE ECG UNIT FOR A PACEMAKER PATIENT OR WITH SIMULTANEOUS USE OF OTHER ELECTRICAL STIMULATION EQUIPMENT. HOWEVER, THE STIMULATION UNITS SHOULD ONLY BE USED AT A SUFFICIENT DISTANCE FROM THE ELECTRODES. IN CASE OF DOUBT, THE PATIENT SHOULD BE DISCONNECTED FROM THE RECORDER.

Safety Notices

THIS UNIT IS CF ⊣♥⊢ CLASSIFIED ACCORDING TO IEC 601-1. THIS MEANS THAT THE PATIENT CONNECTION IS FULLY ISOLATED AND DEFIBRILLATION PROTECTED. SCHILLER CAN ONLY GUARANTEE PROTECTION AGAINST DEFIBRILLATION VOLTAGE, HOWEVER, WHEN THE ORIGINAL SCHILLER PATIENT CABLE IS USED.

IF SEVERAL UNITS ARE COUPLED THERE IS A DANGER OF SUMMATION OF LEAKAGE CURRENTS. WHEN OPERATING SEVERAL DEVICES FOR MEDICAL AND NON-MEDICAL APPLICATION DO NOT USE ANY EXTENSION CABLES OR DISTRIBUTION BOXES FOR THE CONNECTION.

WHEN NON-MEDICAL DEVICES ARE CONNECTED TO THE RS-232 INTERFACE ENSURE THAT BOTH UNITS ARE SECURELY CONNECTED TO THE SAME EARTH POTENTIAL.

WHEN OPERATING THE UNIT ON BATTERY AND SIMULTANEOUSLY USING NON-MEDICAL DEVICES, THE RS-232 INTERFACE MUST BE FULLY ISOLATED.

BEFORE USING THE UNIT, ENSURE THAT AN INTRODUCTION REGARDING THE UNIT FUNCTIONS AND THE SAFETY PRECAUTIONS HAS BEEN PROVIDED BY A SCHILLER REPRESENTATIVE.

THE GUIDELINES FOR PATIENT ELECTRODE PLACEMENT ARE PROVIDED AS ON OVERVIEW ONLY. THEY ARE NOT A SUBSTITUTE FOR MEDICAL EXPERTISE.

THIS UNIT IS PROVIDED FOR THE EXCLUSIVE USE OF QUALIFIED PHYSICIANS OR PERSONNEL UNDER THEIR DIRECT SUPERVISION. THE NUMERICAL AND GRAPHICAL RESULTS AND ANY INTERPRETATION DERIVED FROM A RECORDING MUST BE EXAMINED WITH RESPECT TO THE PATIENTS OVERALL CLINICAL CONDITION. THE RECORDING PREPARATION QUALITY AND THE GENERAL RECORDED DATA QUALITY, WHICH COULD EFFECT THE REPORT DATA ACCURACY, MUST ALSO BE TAKEN INTO ACCOUNT.

IT IS THE PHYSICIANS RESPONSIBILITY TO MAKE THE DIAGNOSIS OR TO OBTAIN EXPERT OPINION ON THE RESULTS, AND TO INSTITUTE CORRECT TREATMENT IF INDICATED.

What's in this book

THE SERVICE PHILOSOPHY FOR ALL SCHILLER UNITS IS FAULT FINDING TO MODULE LEVEL. THE PURPOSE OF THIS BOOK IS TO PROVIDE ALL THE INFORMATION NECESSARY TO ENABLE THE SERVICE ENGINEER TO EFFICIENTLY LOCATE AND REPLACE A FAULTY MODULE. THIS BOOK ASSUMES NO DETAILED KNOWLEDGE OF THE CS-200 BUT DOES REQUIRE THAT THE SERVICE ENGINEER IS FAMILIAR WITH STANDARD WORKSHOP PRACTICES.

The book is divided into the following chapters:

Chapter 1 - Operating Elements

The purpose of this chapter is to provide an easy reference for all the main operator functions and to give a basic introduction to the CS-200. This chapter gives details of the operator controls with the operation and function of each key briefly explained. The information in this chapter provides a background to the operating functions only. Complete operating information is provided in the SCHILLER CS-200 User Guide.

Chapter 2 - Functional Overview

This chapter provides a functional overview of the CS-200. The description is supported by functional block diagrams.

Chapter 3 - Fault Diagnosis & Functional Checks

This chapter provides a guide to locate a fault to module level. The diagnostics are presented in a logical sequence of fault finding algorithms and procedures. Illustrations are provided to support the text where needed.

Chapter 4 - Physical Overview & Module Replacement

This chapter gives an overview of the physical construction of the CS-200 with the main physical attributes of the unit briefly described. The physical description is supported by illustrations showing the internal location of all modules. Removal and replacement instructions for all removable modules are also provided in this chapter. Each procedure is autonomous with details of tools, jumper settings, adjustments and settings or special requirements that are required before and after replacement. Functional checks that must be carried out after replacing a module are also provided.

Chapter 5 - Spare Parts

This chapter provides the part numbers and reordering information for all replaceable modules. Also included in this chapter are details of any special test equipment or special tools required for adjustment or fault finding procedures.

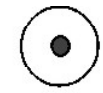
Chapter 6 - Technical Data

The full technical specification of the CS-200 is given in this chapter.

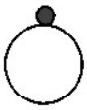
Chapter 7 - Glossary

This chapter explains all the acronyms and signal titles used in this book and in the CS-200 circuit diagrams.

List of Symbols



On



Off

Start (manual) printout

Stop

Auto Mode ECG Recording (and printout)

Battery operation

Mains connected

Potential Equalisation (common ground)

Attention - General warning sign -
see accompanying documentation

Type CF equipment - safe for internal applications
Note: The paddles indicate that the equipment is defibrillator proof

CE 0123

93/42/EEC Medical Devices:
0123 `Notified Body` TÜV P.S.

Chapter 1
Operating Elements

Contents

Introduction

The Schiller CS-200 is a diagnostic workstation designed to record, display, archive, present, and analyse ECG recordings and other measurements. It provides a single solution for cardiology, pulmonary function and circulation diagnosis. Innovative, flexible and expandible are key words in the CS-200 philosophy; the new technology enables the CS-200 to be configured to meet individual requirements and expanded at any time to suit changing user needs.

When taking an ECG recording, measurements, interpretation (option), average cycles and rhythm leads, along with all 12 leads can be printed automatically in the format most convenient to the physician. Favourite print formats can be pre-defined so that obtaining an ECG printout with analysis is a single key operation.

The user interface of the CS-200 is based on the acclaimed SEMA-200 data management system using Windows™ operating system; it is designed to be clear, simple and intuitive. Because of this, the CS-200 can be used immediately with minimal operator training.

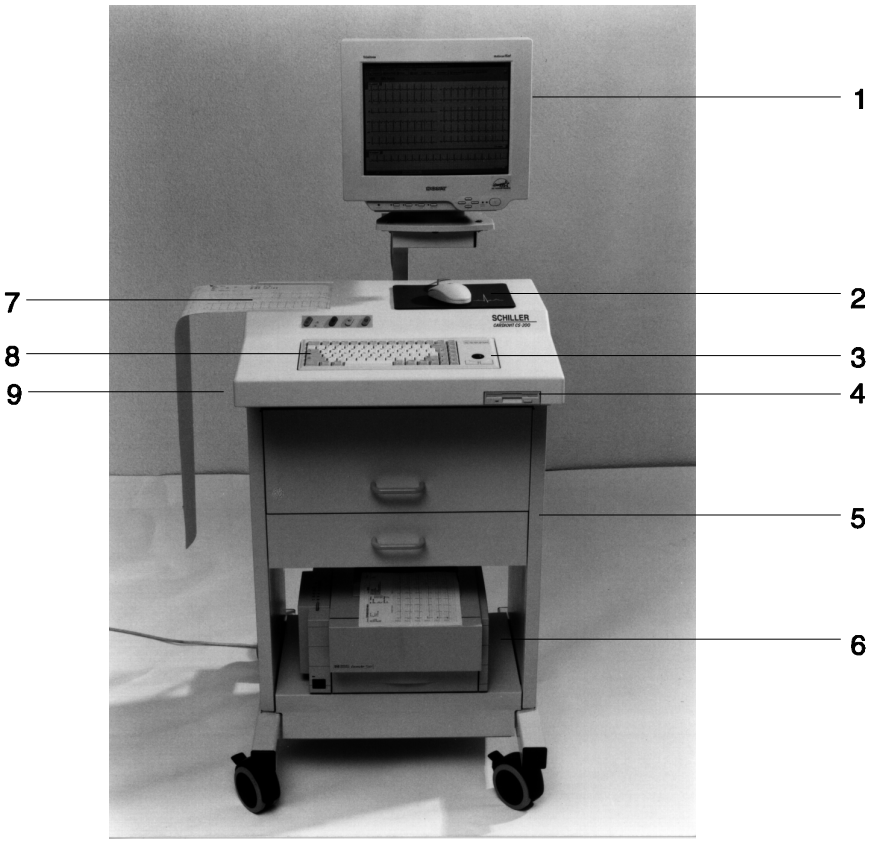
The CS-200 has the following features as standard:

- Simple one key operation with dedicated function keys and icons
- Mouse and trackball operation for menu selection
- Resting ECG with pacemaker detection, measurements and average cycles
- Resting Rhythm
- Storage facilities: 200 ECGs without archiving - before May 1998 / S/N 030.00504
  unlimited - after May 1998 / S/N 030.00504
- Interface for external blood pressure unit
- Interfaces for control of both analog and digital ergometers / treadmills
- Interfaces for dc input and dc output
- Automatic and Manual ECG recording
- Selectable print formats with integrated quality thermal printer
- 3 1/2`` 1.44 MBytes floppy drive
- CD ROM-drive
- 17" Monitor

Options

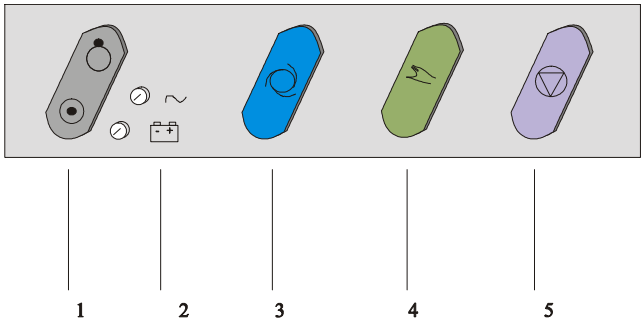
- ECG Interpretation
- Pacemaker measurement
- Exercise ECG
- EXEC exercise analysis program with ST measurement, average complexes, trends and interpretation
- EXECplus with Full Disclosure
- SDSplus data management system giving the ability to store/archive an unlimited number of recordings with full analysis and transmission facilities - only for units older than S/N 030.00504, included in newer units
- QT dispersion (resting ECGs)
- Integrated blood pressure module
- Holter System
- Laser Printer
- Remote Analysis Software
- Spirometry
- Late Potentials
- RR Variability (later option)
- Security transformer
- LCD - Monitor

Physical Layout

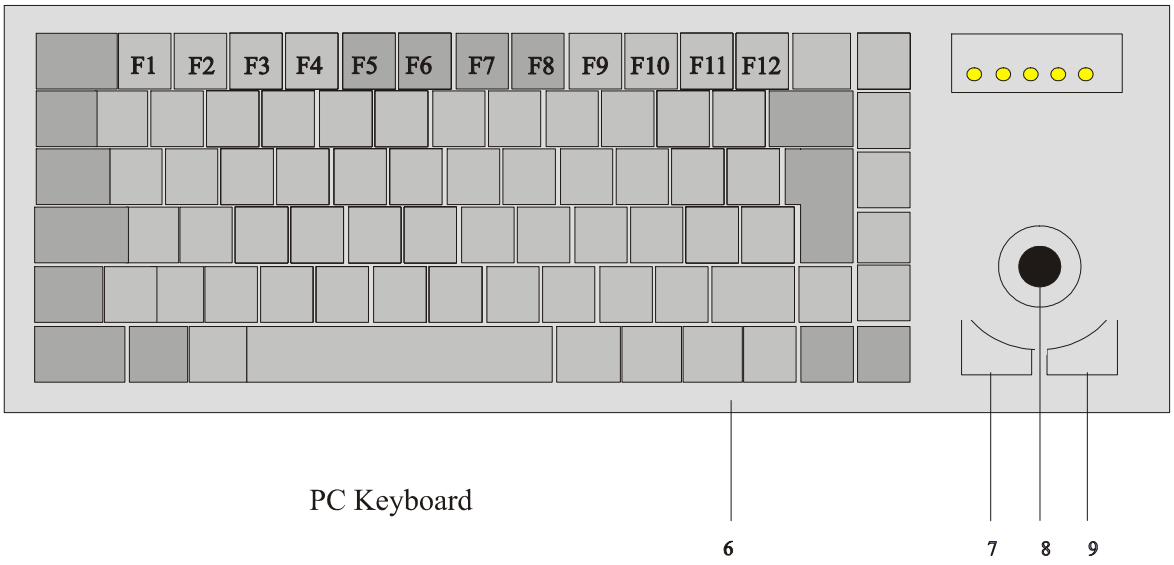


1 Display Monitor
2 Mouse
3 Trackball
4 Floppy Disk Drive
5 Storage Drawers
6 Optional laser printer
7 Thermal Printer
8 Keyboard
9 CD ROM-drive

Keyboard



Console keys



PC Keyboard

1 ON/OFF key located on the console keypad

2 Power Indicators - mains and battery. The mains indicator shows that mains is connected: the battery lamp indicates that the unit is running on battery power (mains power disconnected during use - no screen display and emergency printout only possible).

3 AUTO Key - start an ECG recording (resting) in auto mode

4 MANUAL key -continuous printout of ECG

5 STOP key - stop printout, run paper to start position

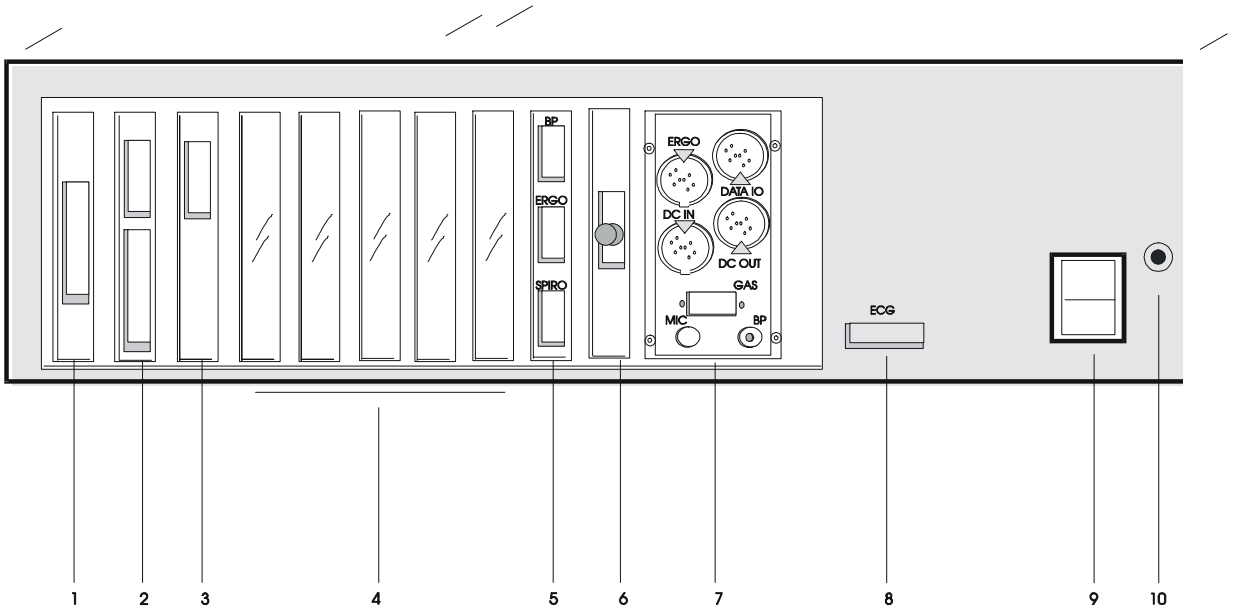
6 Keyboard with function keys

7 Selection key - button 1 (left key)

8 Trackball

9 Selection key - button 2 (right key)

External Connections - Back Panel



1	COM 2, RS-232 (spare)
2	Bottom connector - Printer Top connector - Mouse / COM 1, RS-232
3	Monitor connector
4	Reserved slots for additional modules (5 off)
5	RS-232 interface for connection of external blood pressure unit RS-232 interface for control of treadmill/ergometer Interface for connection of Spirometry unit
6	Reset Button
7	Input / Output panel containing the following: ERGO connector for the connection of an analog controlled treadmill (5pin) DATA I/O connector for the connection of QRS trigger (7pin) DC IN connector for the input of dc (ECG) signals from another unit (5pin) DC OUT connector for the output of dc signals (3pin) RS-232 connector for the connection of a gas analysis unit Microphone connector (for NIBP) Pressure (cuff) connector (for NIBP)
8	ECG Connector
9	Mains connector (in and out)
10	Potential equalisation stud

Preparation & Power Supply

Location

- Do not keep or operate the unit in a wet or dusty environment
- Avoid exposure to direct sunlight or heat from other sources
- Do not allow the unit to come in contact with acid vapours or liquids
- Do not place the unit in the vicinity of X-ray or diathermy units, large transformers or electric motors.

Potential Equalisation

The potential equalisation stud at the rear of the unit can be used to equalise the ground potential of the CS-200 to that of all mains powered equipment in the vicinity. Use the hospital or building common ground.

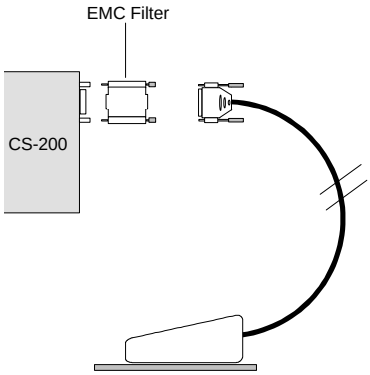
To avoid possible interference from the Ergometer when carrying out an exercise test, we recommend that both the CS-200 and the Ergometer are connected to the same common ground.

The potential equalisation connector is situated on the rear of the unit. A yellow/green ground cable is supplied as an option (Article number 2. 310 005).

EMC Protection

The CS-200 offers EMC protection when the mouse filter connector is inserted between the mouse connector on the unit (COM 1) and the mouse.

DO NOT REMOVE THE FILTER CONNECTOR

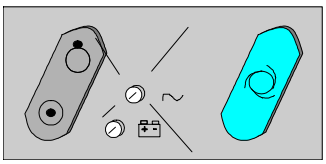


Mains Supply

The unit is set for the mains supply of your country. When mains is connected the mains indicator on the console keypad is lit.

Backup Battery

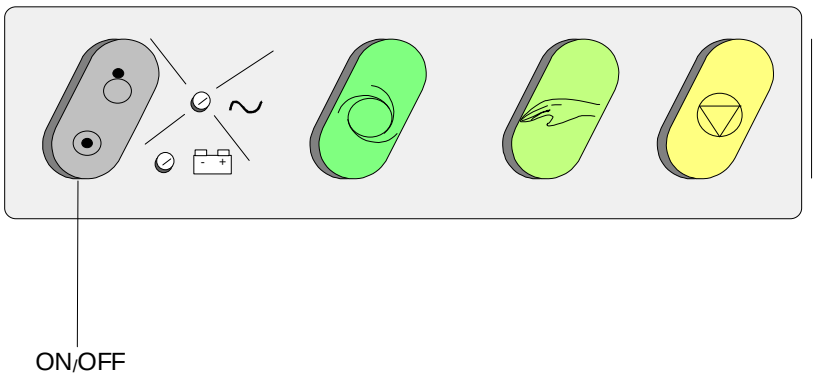
A backup battery is incorporated in the CS-200 for emergency use in the event of a mains power failure. The backup battery allows the unit to complete a resting ECG recording. If a power failure occurs the screen will go blank but the processor continues to function for a minimum period of three minutes. This is enough time to complete a resting ECG and provide a complete printout.



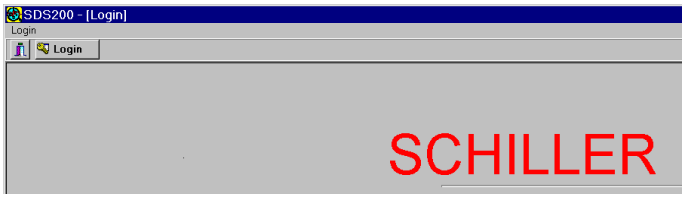
Switching the System ON

Switching the System ON

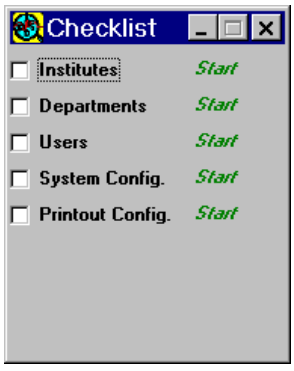
1. Press the ON / OFF key on the console keypad.



2. If the system is properly set, the CS-200 main screen comes up.
3. If the Windows desktop is displayed, double-click on the SDS-200 icon to get to the Login screen.



4. Enter your User.ID and Password to get into the main menu (Patient / Record Selection screen)
5. Use the Checklist menu to enter Institutes, Departments etc. by clicking on Start for each category. If the Checklist menu is not displayed go to menu System / Settings / System Configuration and check the box "Show Checklist after Restart".



Program Overview

In addition to view screens, the CS-200 has two main displays from which all settings, measurements, and functions are selected. All of the displays have menu options on the top of the screen and icons for the main functions. The two main displays are as follows:

° Patient / Record selection screen (main menu) > enter the resting and exercise data acquisition and search and view screens from here.

° Search screen > select the record to be viewed.

Select a Patient / recording in the main menu or the search screen prior to recording or to view a previous recording.

To enter the Resting ECG screen press the R ECG icon

To enter the Exercise ECG screen press the E ECG icon

At all times to return to the main menu (patient / record selection), press the return icon on the left of the icon bar.

In addition function keys or menu selections can be made to enter the different screens. The function keys are detailed on page 10.

Full details of the patient and search screens and data management functions are given in the CS-200 User Guide Section 2.

Full details of viewing resting ECG and exercise ECG data are given in the CS-200 User Guide Section 3.

Full details of carrying out a resting ECG and resting ECG settings are given in the CS-200 User Guide Section 5.

Full details of carrying out an exercise ECG and exercise ECG settings are given in the CS-200 User Guide Section 6.

Details of all system settings are given in the CS-200 User Guide Section 8.

Function Keys

In each screen in addition to the menu options and function icons, function keys F1 to F12 perform different functions dependent on display. The function keys are as follows:

	Patient / Record selection	Resting ECG (Acq)	Resting ECG (View)	Ex ECG (Acq)	Ex ECG (View)
F1	Help		Help		
F2			Pat/Rec.select		Pat/rec.select
F3	Search	Man. Start	View Rythm	Man.Start	View Rhythm
F4		Stop		Stop	
F5	Print (ext.)	Auto Start 1	Print (ext.)		Print (ext.)
<sh>F5	Select format and print	Auto Start (format 2)	Select format and print		Select format and print
F6		Filter On/Off	Filter On/Off	Filter On/Off	
<sh>F6		Recenter		Recenter	
F7	Sort on name		Serial comp.	Next step	Ergo main
F8	Sort on ID				Averages
F9	View Rec.		Interpretation		Interpretation
<sh>F9			Measurement		ST amplitudes
F10	Select menu	Select menu	Select menu		Select menu
F11				Input BP	
<sh>F11				Input Sympt.	

*** Switch Myogram filter (muscle tremor) filter on or off. When the filter is on, the filter icon (top of screen) is highlighted yellow.

** Printout of real time ECG

* Proceed to next stage of test e.g. Start, Begin, Recover, End

Patient / Record Selection (Main Menu)

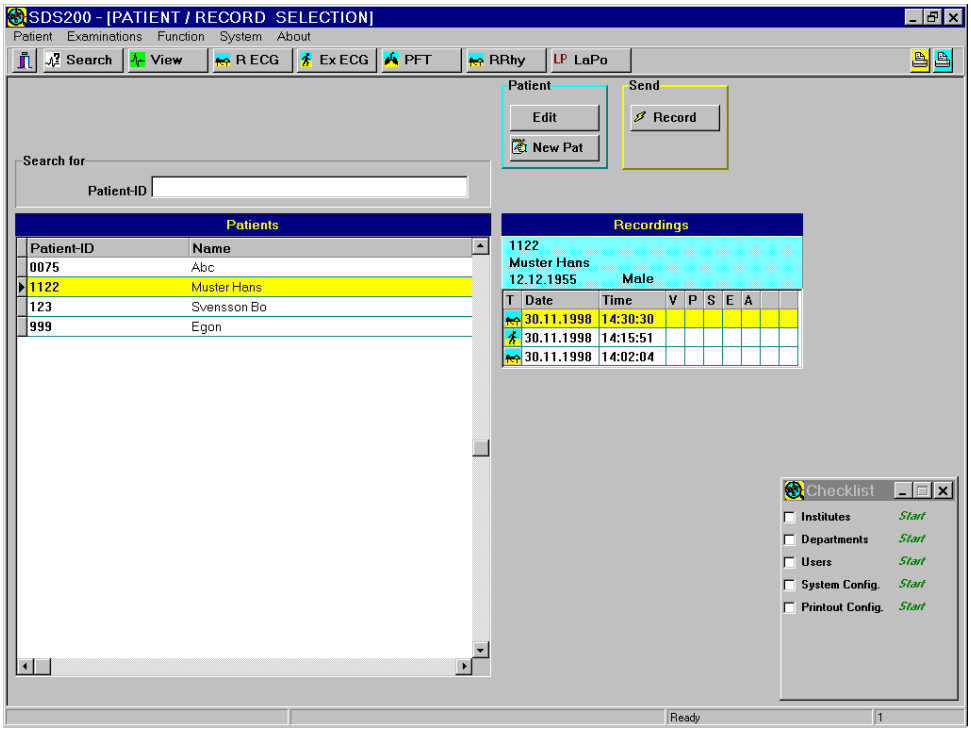
In the Patient / record selection screen you can:

- Select Data Management Functions
- Make/change system settings and user settings
- Make entries in the data tables
- Enter the View, Search and Data Acquisition screens

The main menu can be entered from the view or data acquisition screens in any of the following ways:

- Press the return icon 
- Select `Main menu` option in the Patient menu
- **Press the ESC key on the keyboard**

The patient / record selection screen is displayed:



Clicking on one of the menu headings at the top of the screen displays further options; these can be settings, functions or information displays. Clicking on the search icon (below the menu bar) enters the Search screen (to search for specific recording and or patient). To select a menu item move the track ball (or the mouse) so that the cursor is placed over the item and click with the left button.

All system settings are detailed in the CS-200 User Guide Section 8.

The patient screen and data management functions are detailed in the CS-200 User Guide Section 2

Patient / Record Selection

In the Patient Screen you can:

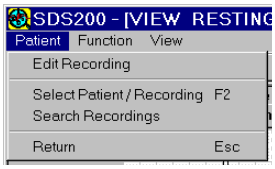
- Select, Display and Edit Stored recordings
- Select a patient before carrying out an ECG
- Select, Display and Edit patient data
- Print a Stored recording
- Delete a stored recording and/or Patient
- Send a recording to a PC

To get into the Main menu from the search and view screens:

- **Press Function key F2** **OR**
- **Click on the patient icon** 

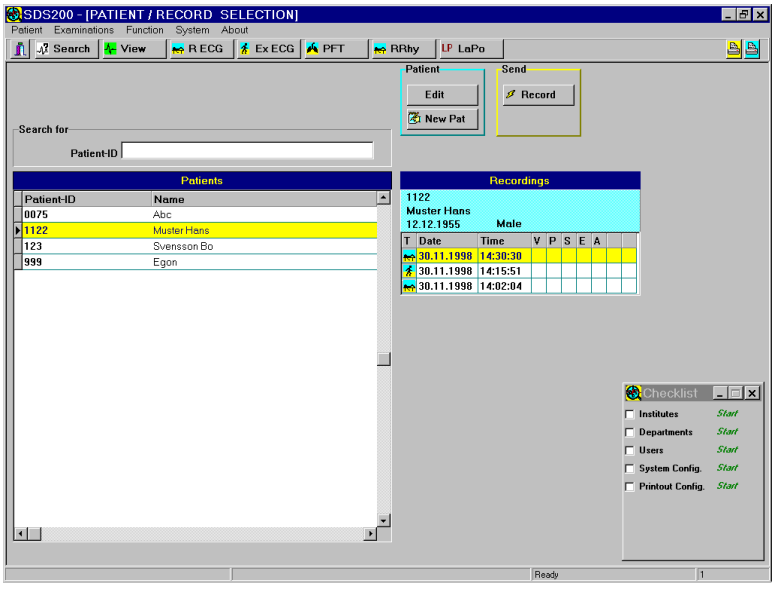
OR

  the return icon  **OR**

- **Select from the patient menu** 

Use the mouse or trackball to select required patient. A list of all recorded ECGs for that patient is displayed in the right table. You can view a specific recording by highlighting a recording and double-clicking with the left mouse button. Alternatively click on the View icon at the top of the screen.

Tip *When the R ECG or Ex ECG icon is pressed with a patient selected in this screen, the ECG screen is displayed and the patient data automatically entered.*

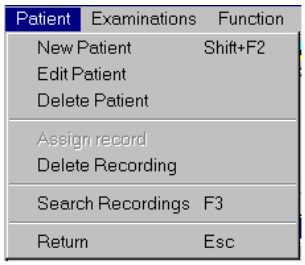


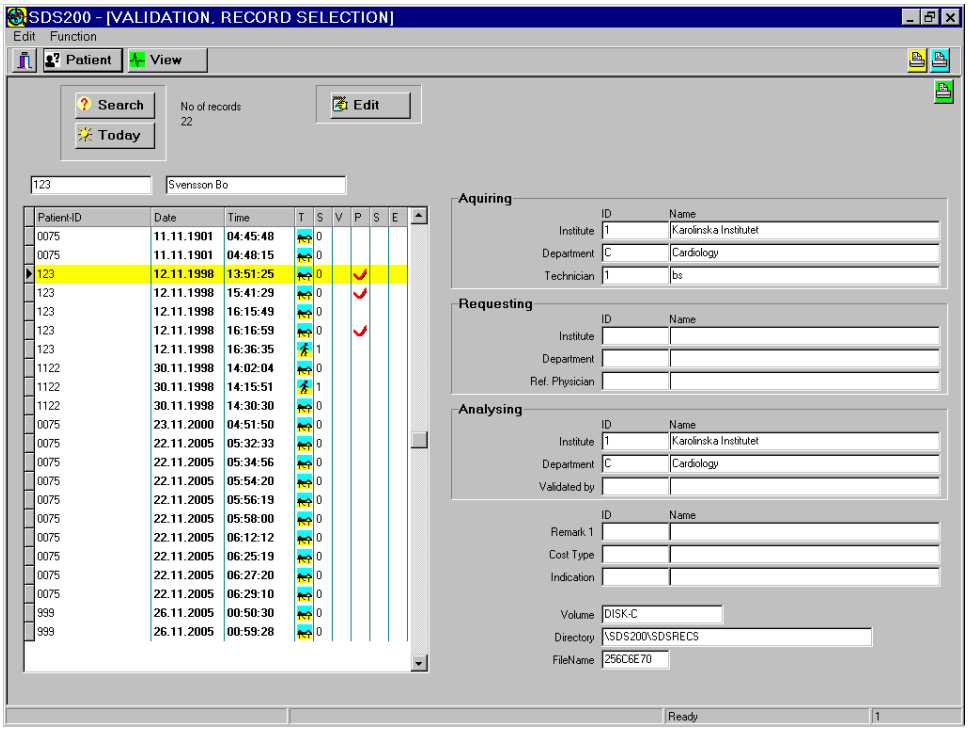
Searching for Recordings and Information (Search Screen)

To get into the Search Screen from the main screen:

- **Press Function key F3** **OR**
- **Click on the Search icon** 

OR
- **Select from the patient menu**





The icons on the top of the display give certain options as follows:

Search — Defines the search parameters - This allows you to search all recordings validated, for example by a specific consultant or specific department etc. A number of search parameters can be defined. When a change is made in the search parameters OK must be clicked. You are then prompted to confirm new settings. When you confirm the newly defined search parameters are set.

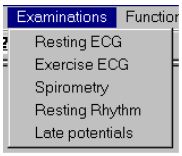
Today — Display only the recordings which have been made today.

Edit — Patient / recording data can be edited.

Resting ECG Screen

When in another screen the Resting ECG can be entered in any of the following ways:

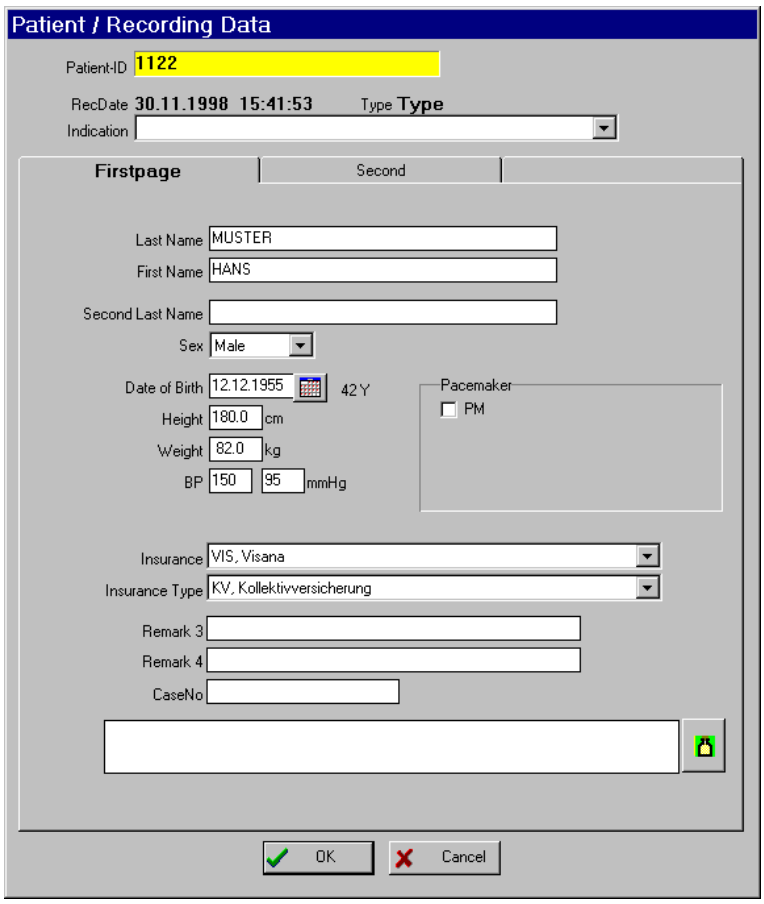
- **Select from the Examinations menu**



OR

- **Select and click the Resting ECG icon** 

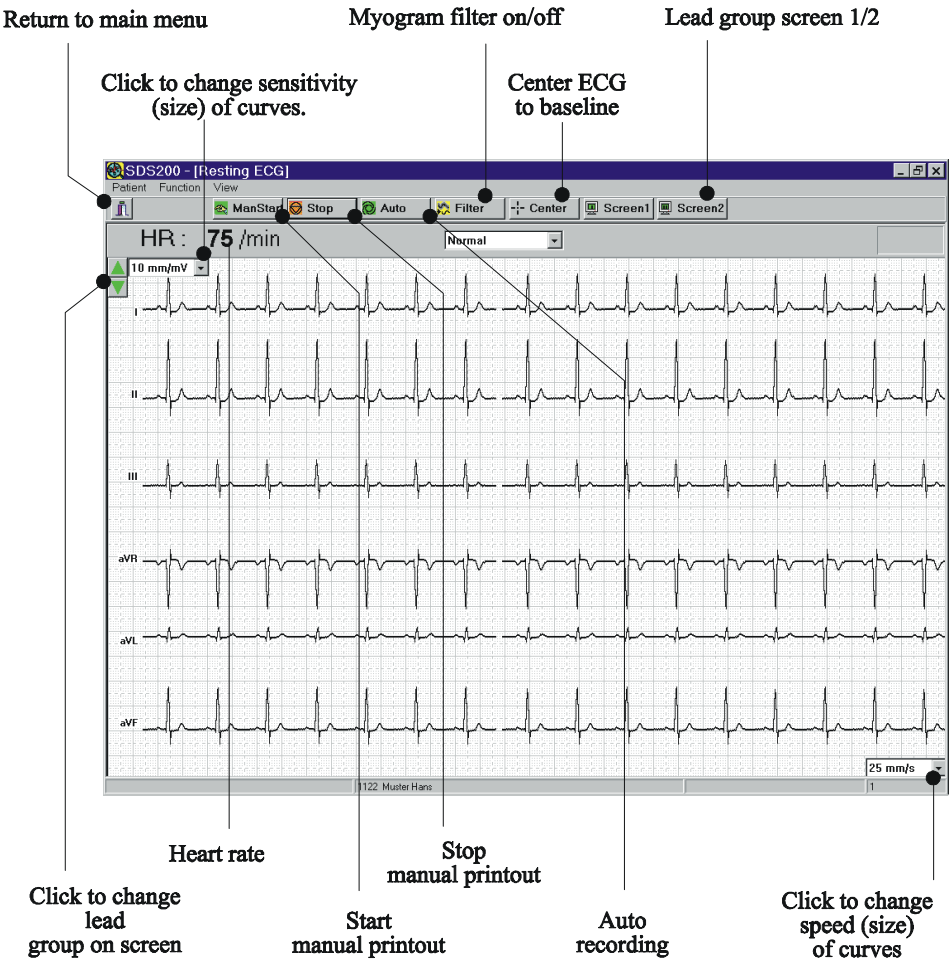
When the RECG has been selected, the patient / recording data is displayed, enabling last minute editing of patient data.



When all patient data have been checked, finish with OK. The resting ECG screen is displayed.

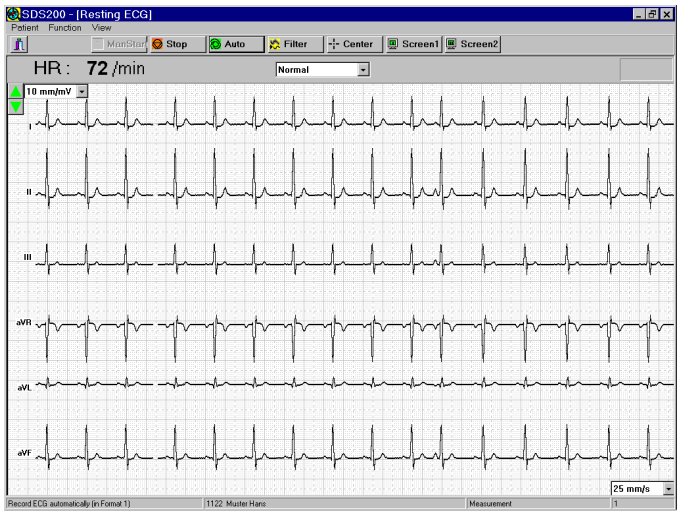
Resting ECG Screen (cont.)

At the top of the ECG screen are two lines of options. The top line (Patient, Function, View) gives the main function and setting options. When one of these headings is selected, further options are given; these can be settings, functions or information displays. The bottom line (with the icons) is the function line and provides a `short cut` to the commonly used functions. To select a menu item move the track ball (or the mouse) so that the cursor is placed over the item and click with the left button.



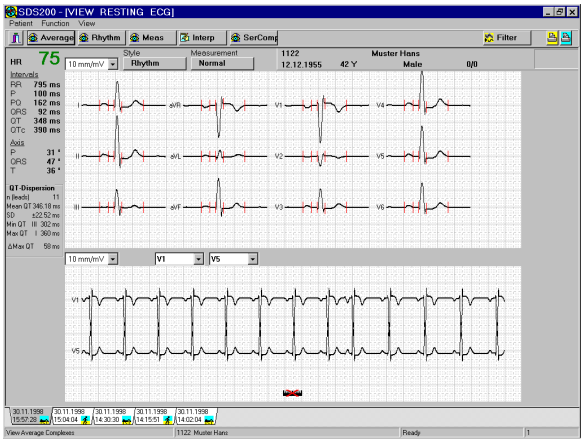
Typical Resting ECG Screens

Resting ECG *Data Acquisition*

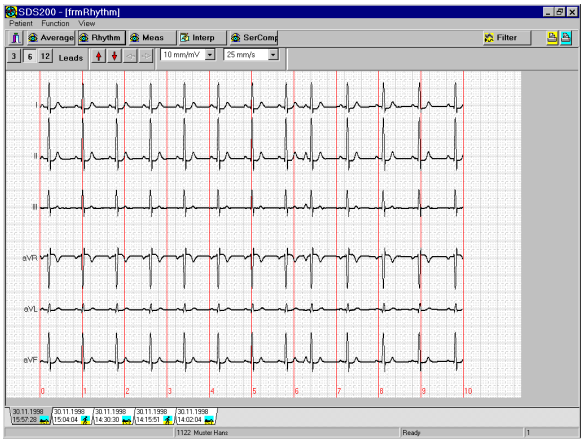


Auto ECG / Stored ECG

Average Screen

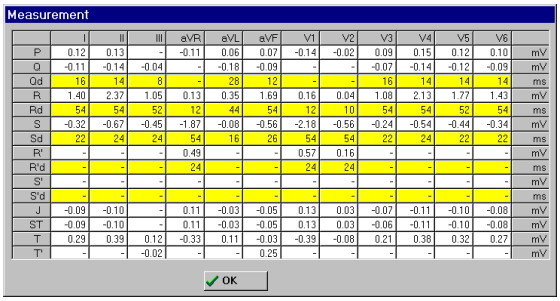


Rhythm Screen

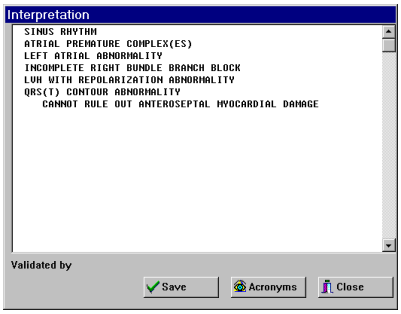


Displayed when requested

Measurements table



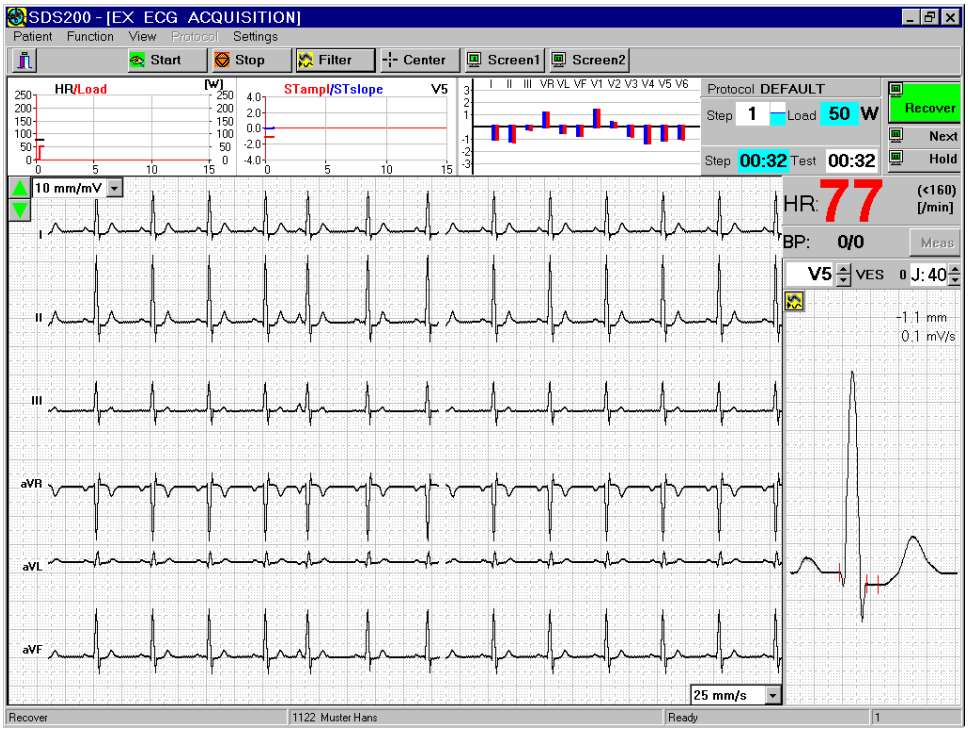
Interpretation screen



Exercise ECG Screen

When in another screen the Exercise ECG can be entered in any of the following ways:

- **Press function key F11** **OR**
- **Select and click the Exercise ECG icon** 

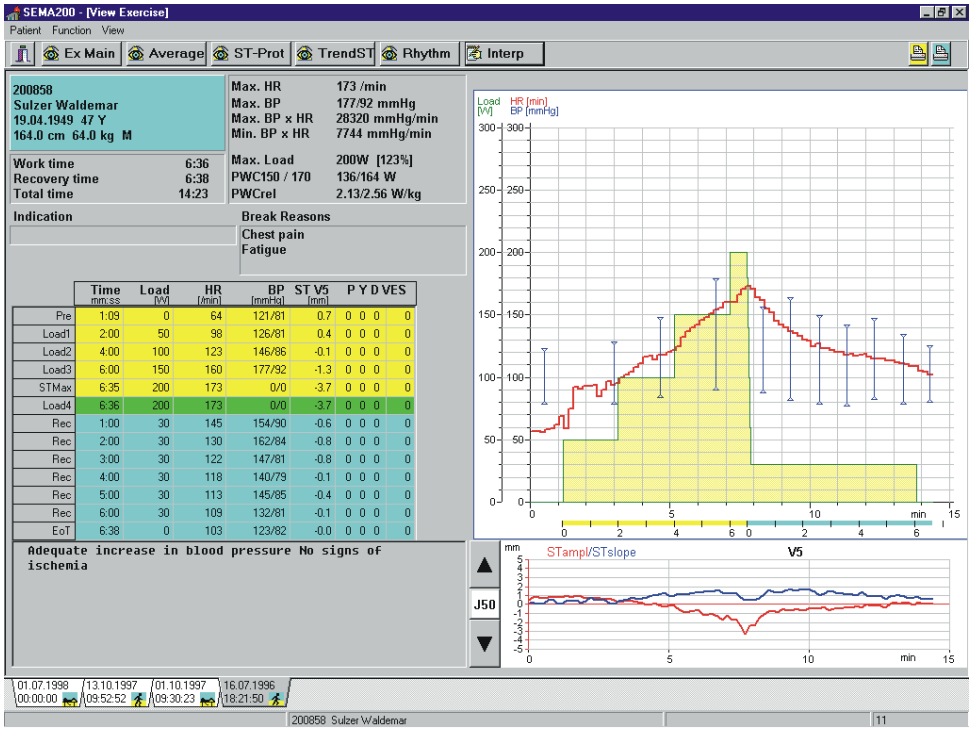


Exercise ECG

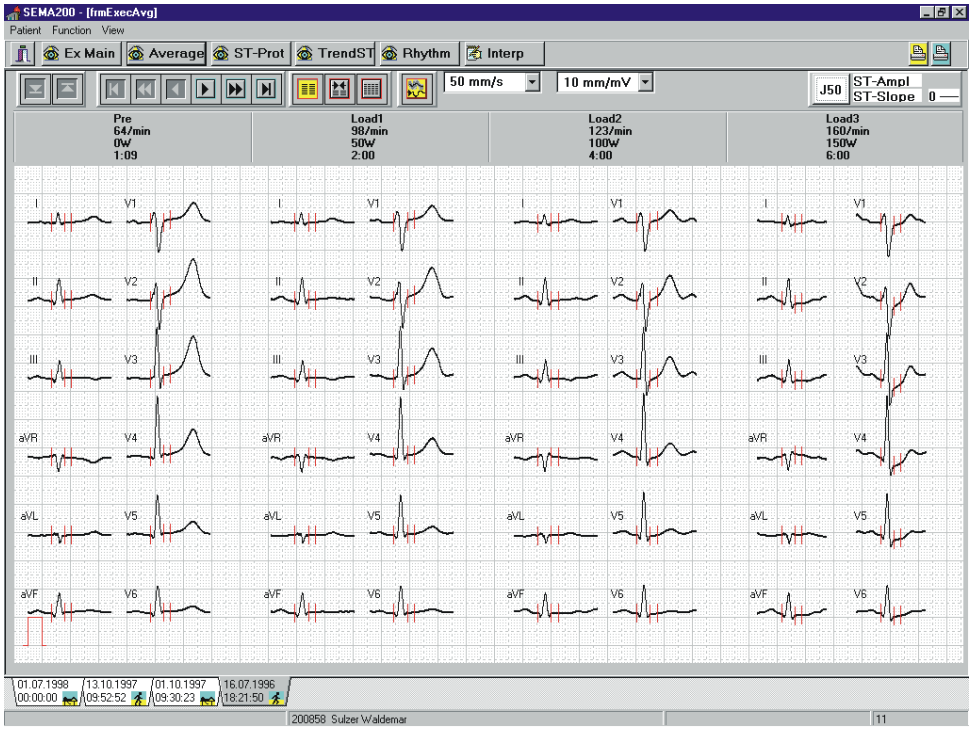
Acquisition

Typical Exercise ECG Screens

Final Report / Stored ECG *Main*

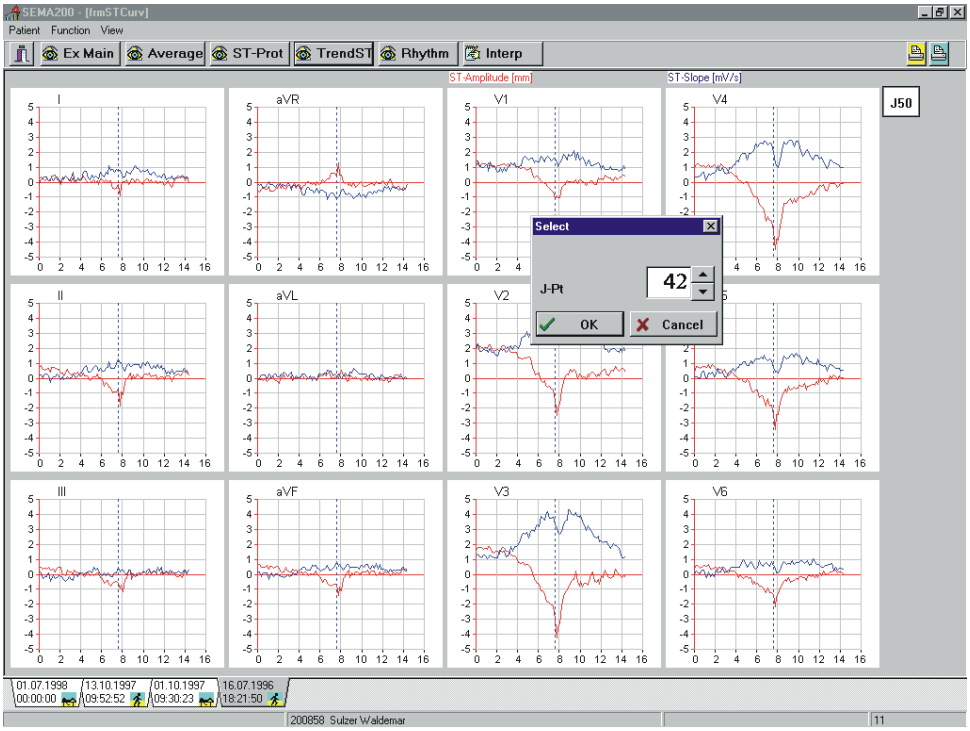


Average

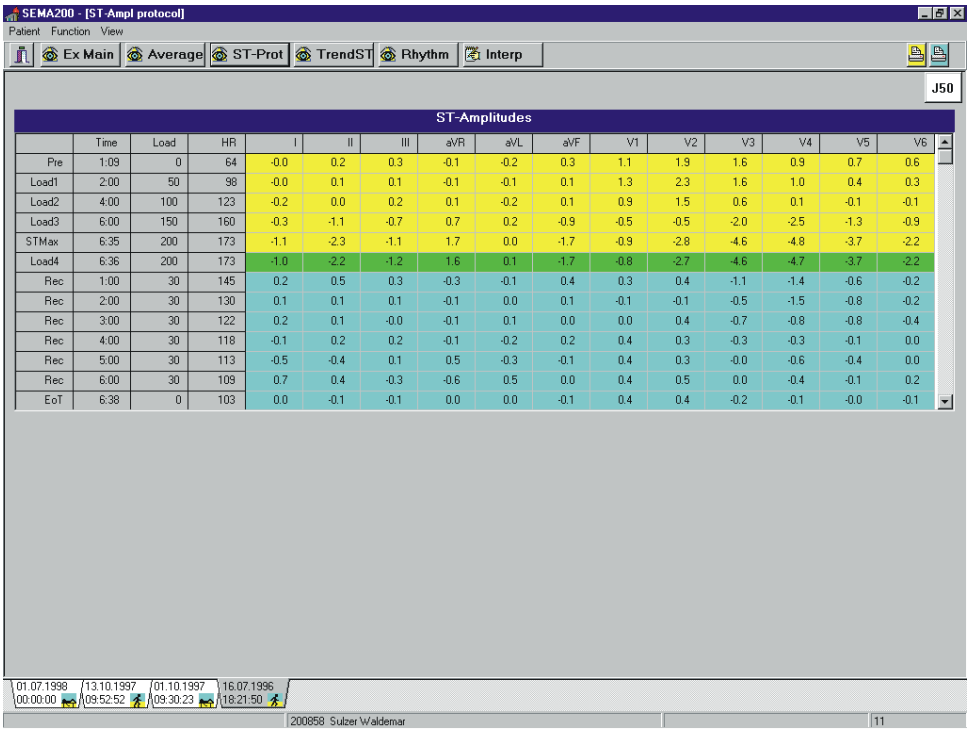


Typical Exercise ECG Screens (cont.)

ST Graph

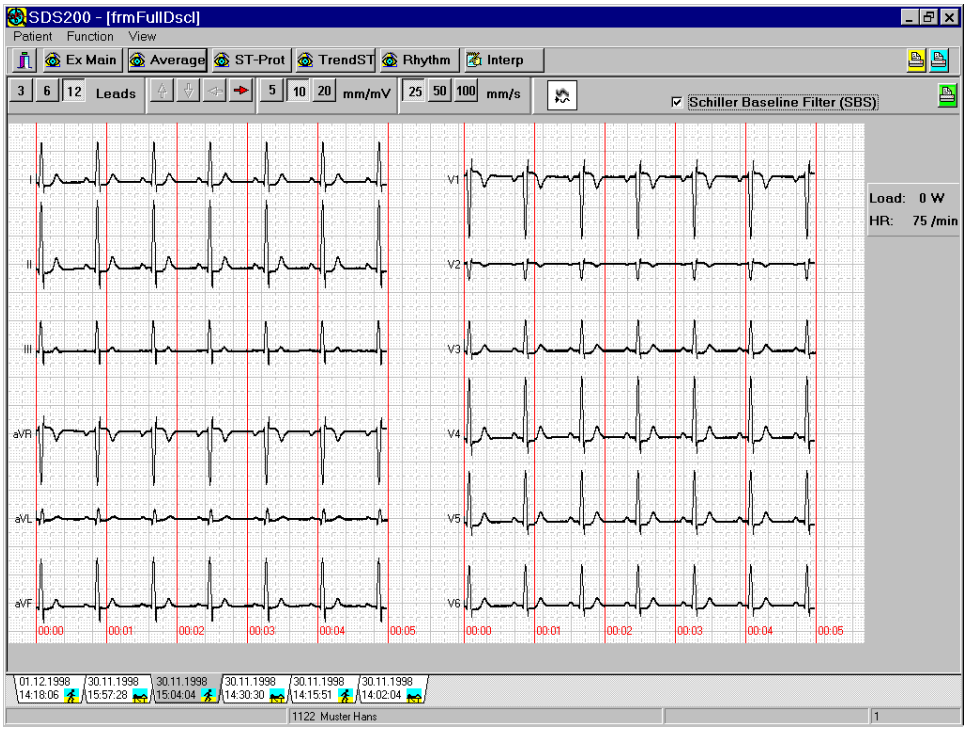


ST Measurements



Typical Exercise ECG Screens (cont.)

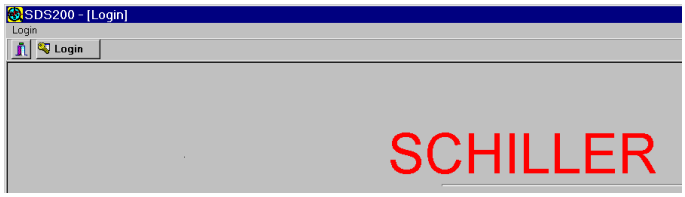
Full Disclosure



Exiting a Display / Switching the Unit Off

The icon on the extreme left of the icon bar has two functions:

1. When in any display other than the main menu, clicking on this icon returns you to the main menu (Pat / rec selection)
2. When the main screen is displayed, clicking on this icon returns to the Login screen.

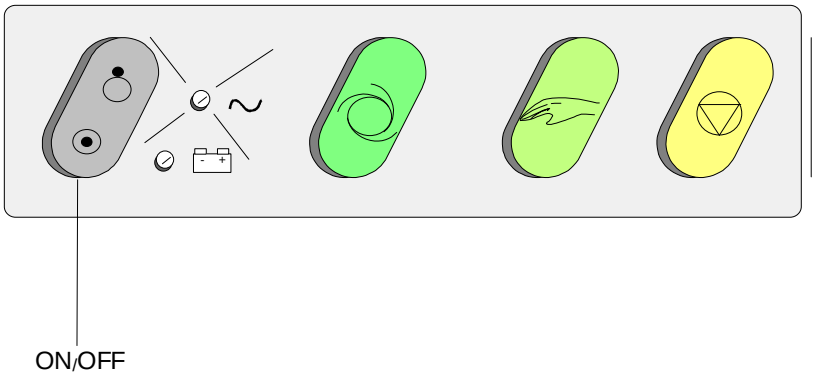


Switching the Unit Off

1. Click the program icon in the top left corner of the screen >> 

and select CLOSE OR
2. Click the OFF cross (x) in the right hand side of the title bar

3. Shut down Windows as usual.
3. When given the Windows prompt `It is now safe to turn off your computer` press the ON/ OFF button on the keyboard to shut down the system.



Chapter 2
Functional Overview

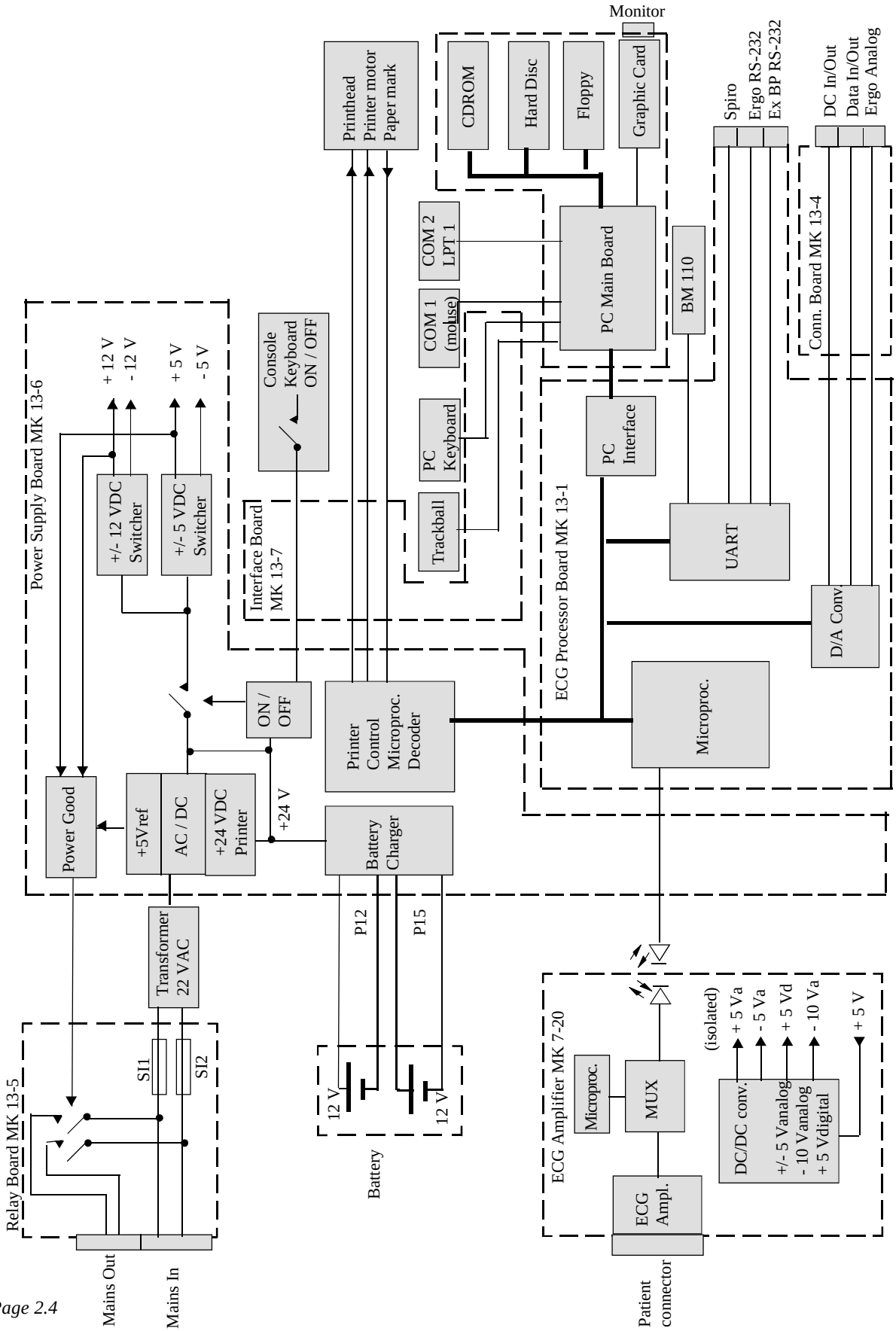
Contents

System Overview

The CS-200 is built up on a PC architecture, which means that expansions like network connection etc. very easily can be realised by utilizing standard interface cards available on the market or ordered directly from Schiller AG. The interfaces for the ECG amplifier, the real-time printer and other connections for spirometry, DC in- and output, exercise tests, blood pressure measurement etc. are included on a special Schiller processor card attached to the ISA bus. A second Schiller PC board supplies power to the printer and the other connections.

The operating system in the CS-200 is Windows® 95. The user interface, all settings, graphical presentations etc. are based on Windows®. The evaluation of the ECG data, control of the printer and other functions are realised on the Schiller ECG processor card with its own 68331 mikroprocessor system. The systems communicate with each other via dual port RAMs.

Functional Block Diagram



Functional Elements

The CS-200 system basically contains the following major modules:

- Power supply
- Connector board
- ECG amplifier
- ECG processor
- Thermal printer

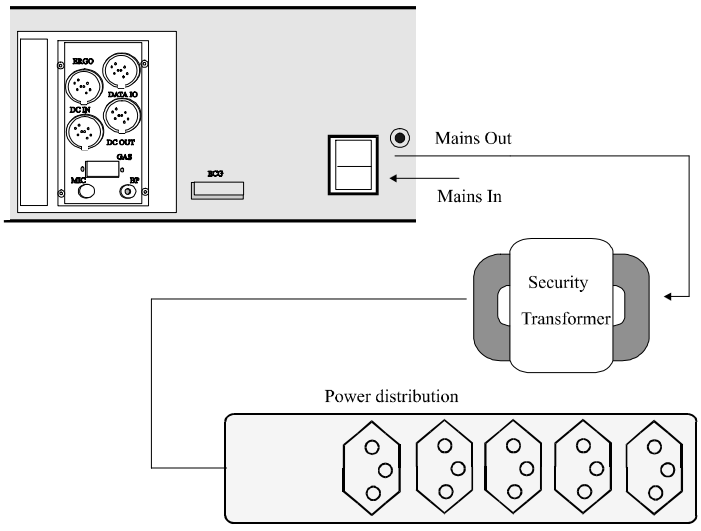
Mains Supply

The power to the system is supplied via an 80 VA isolation transformer. The CRT monitor and auxiliary equipment like printer, defibrillator, gas analyser etc. are supplied from the mains distribution at the back of the trolley. This power distribution is controlled by the POWER ON / OFF switch.

The power for the PC, the real-time printer and the rest of the electronics is taken from the secondary coil of the mains transformer. There is no Mains Switch. For mains failures less than 3 minutes the emergency operation of the equipment (without monitor) is secured by two 12 V / 800 mAh lead batteries.

Security transformer

The leakage currents from the equipment, which could harm the patient, are within the european safety norms if the patient is located at least 1,5 m away from the equipment. For US applications and other more stringent safety requirements, a security transformer must be used. This transformer is installed in one of the drawers of the trolley. It gets its input from the mains output on the back panel and the secondary coil feeds the power distibution at the back of the trolley.



Functional Elements (cont.)

Relay board MK 13-5

Mains are input to the relay board (P13) where also the mains fuses are located. The 230 VAC are passed on to the transformer (P14) and the secondary coil output, 22 VAC, is fed to the power supply board MK 13-6 (P11), where the necessary DC voltages are generated. When all proper voltages are present, a POWER GOOD signal is active. Pressing the ON / OFF dedicated switch on the console activates the relays (P10) and mains are switched to (P13) the mains distribution at the back of the trolley and so to the monitor.

Power supply board MK 13-6

The 22 VAC from the secondary coil of the mains transformer is rectified and generates +5Vref and +24 VDC for the printer motor and for charging the two 12 V batteries. When the ON / OFF key on the console is pressed, the +/- 5 VDC and +/- 12 VDC switchers are activated and supply the PC components and the other boards with the proper voltages.

When the +5Vref , +5V and +12 V are available, a POWER GOOD signal is generated, which activates the mains relays on the Relay Board MK 13-5. Mains power is now passed on to the power distribution at the back of the trolley and so to the monitor and other auxiliary equipment.

12 VDC is also supplied to the CPU ventilator on the PC Main Board and the cabinet ventilator.

The printhead and the printer motor are controlled by a microprocessor / decoder, which is hooked up to the data bus.

In case of mains failure, the +/- 5 V and +/- 12 V switchers are supplied with 24 VDC from the two 12 V batteries. As the +5V reference is not present, the relays on the relay board are not activated, which means that the monitor and auxiliary equipment are not supplied with mains.. Emergency operation from battery supply enables ECG measurement and printout without monitor up to 3 minutes.Functional Elements

Connector Board MK 13-4

The connector board contains connectors for auxiliary equipment like gas analyser, blood pressure measurement, ergometer etc. These connections also control the load of stress equipment used for exercise ECGs. The board contains also the necessary filtering for these connections, which are all available on the back panel.

ECG Amplifier MK 7-20

DC / DC converter circuits produce isolated power voltages for +/-5V analog, -10V analog and +5V digital required by the ECG amplifier circuits.

The 12 incoming ECG signals are low-pass filtered (approx. 10 kHz) and applied to non-inverting operational amplifiers. The signals are then further low pass filtered (approx. 400 Hz) before they are being applied to the multiplexer.

The multiplexer has a sampling rate of 1000 Hz and multiplexes the 12 signals to 2 outgoing channels ECG0 and ECG1. These signals are passed on to the ECG processor board via an optical coupler, which ensures total electric isolation of the patient.

Functional Elements (cont.)

ECG Processing Board MK 13-1

This board is designed for a 16 bit ISA-Bus with a Motorola 68331 mikroprocessor. It is connected to the PC board via dual port RAMs. The program memory consists of a Flash-EPROM which is firmly integrated on the board. Software updates can be made from the floppy drive or the hard disk.

The incoming, multiplexed ECG signal is processed by the microprocessor and passed on to the data bus. ECG measurement, evaluation and interpretation is performed on this board. The load for bicycle and treadmill for exercise ECGs as well as ergospirometry is controlled from here. In addition, signal processing for all connections on the connector board MK 13-4 is done.

Thermal Printer

The thermal print head is controlled by a print head controller and a CPU timer circuit. The print head controller serialises the data for the print head and the timer circuit controls how long current is applied to the head, and thus the intensity of the printout.

Strobe generation is controlled by the CPU when one complete pixel line of data is ready to be written.

Chapter 3
Fault Diagnosis & Functional Checks

Contents

ONLY PERSONNEL WHO HAVE ATTENDED A SCHILLER CS-200 SERVICE TRAINING COURSE ARE AUTHORISED TO CARRY OUT ANY SERVICE PROCEDURES

Introduction

The CS-200 is designed to be simple to use and simple to service: the service philosophy of the CS-200 is module replacement and not board repair. The purpose of this chapter is to provide fault-finding procedures that will quickly and efficiently identify a fault to a specific module. Fault-finding procedures are designed so that test equipment is kept to a minimum.

Use the fault finding charts and procedures on the following pages to indicate a faulty area or module. In most cases the fault finding charts should indicate the most likely faulty area. When more than one module is stated, check / replace the modules in the order given. When a module has been replaced specific test parameters and setting-up of the module may be applicable. The removal and replacement instructions for all replaceable modules, along with any setup or check procedures required, are given in Chapters 4 and 5.

If the initial fault-finding chart does not indicate the area where the fault exists, re-check all the settings and parameters that have been entered. If these are correct, check the software.

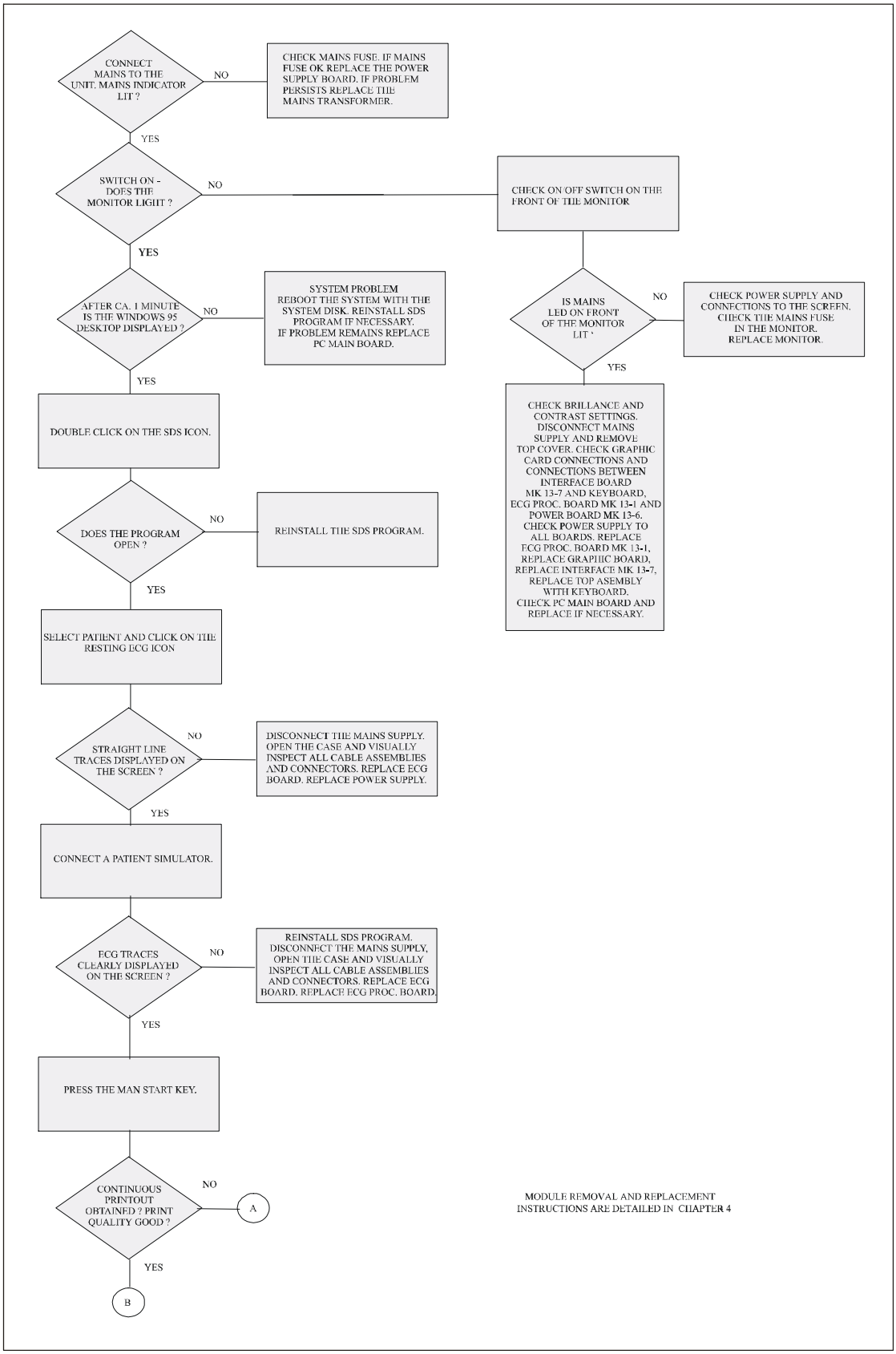
General Check Procedures

The procedure detailed here is a general confidence check in the unit after an internal module or board has been replaced. It is not a full functional test (which can only be carried out with dedicated equipment in the factory) but is intended to provide a general confidence check in all of the major CS-200 functional areas. The instructions given here are provided as a guideline only. If more operating information is required (general settings, comprehensive menu guides etc.) please refer to the CS-200 User Guide.

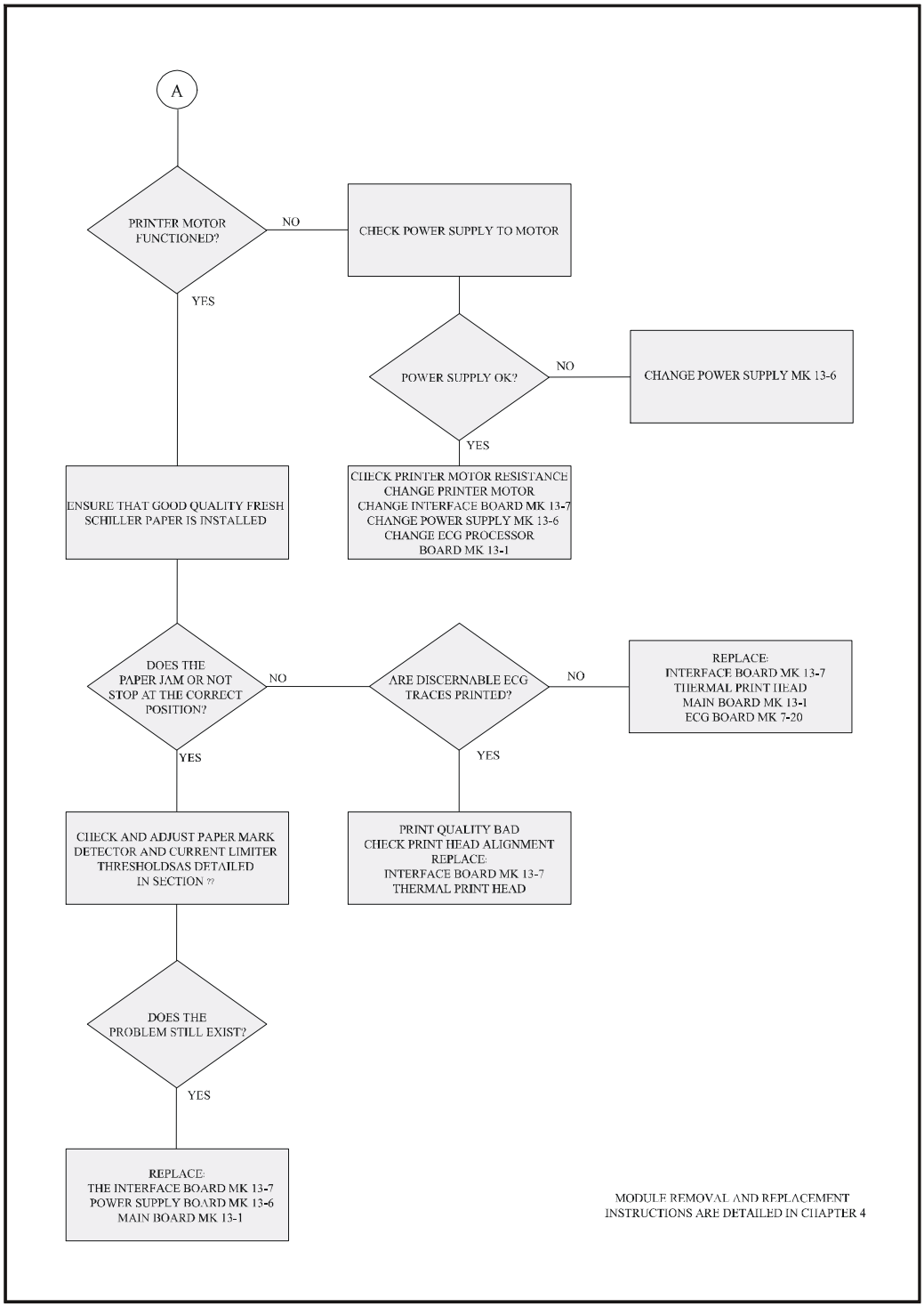
To carry out the general CS-200 functional check procedure, proceed as follows:

1. Connect mains power to the unit and ensure that the green mains LED lights.
2. Switch the unit on by pressing the <ON> key on the keyboard. Ensure that after approximately a minute the Windows 95 desktop is displayed.
3. Double-click on the SDS-200 icon and login as Default User.
4. Unless the main menu is already displayed, select Patient / Recording by clicking on the Patient icon.
5. Click on the Resting ECG (RECG) icon. Patient / recording data is displayed. Systematically press all keyboard keys and ensure that all keys register. click on OK or Cancel.
6. Check that straight line traces are displayed.
7. Connect an ECG simulator to the ECG connector on the back panel. Ensure that the ECG is displayed on the screen.
8. Press the <MAN START> key and ensure that the ECG is printed. Check the quality of the printout. Press the <STOP> key to halt the printer.
9. Press the <AUTO START> key and wait approximately 10 seconds for the printout to commence. Ensure that the printout is accurate and of good quality.
10. Click on the Exercise ECG icon. Ensure that the exercise screen is displayed. Click START / BEGIN and ensure that the test commences (on the screen).
11. After about a minute click on RECOVER. After a while click on Recover again and then on END. Ensure that the test stops and patient data is displayed.

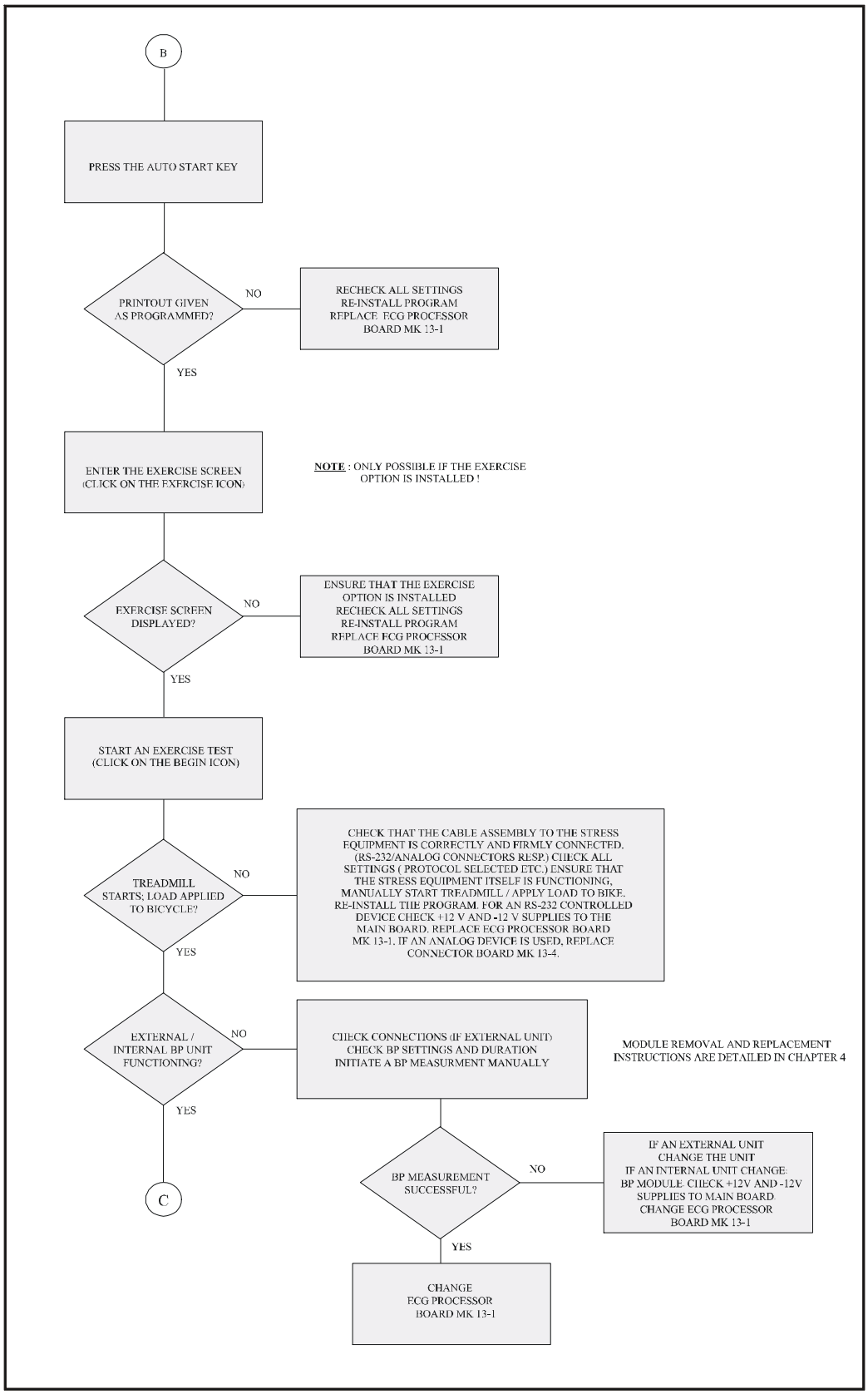
Fault Diagnosis Chart



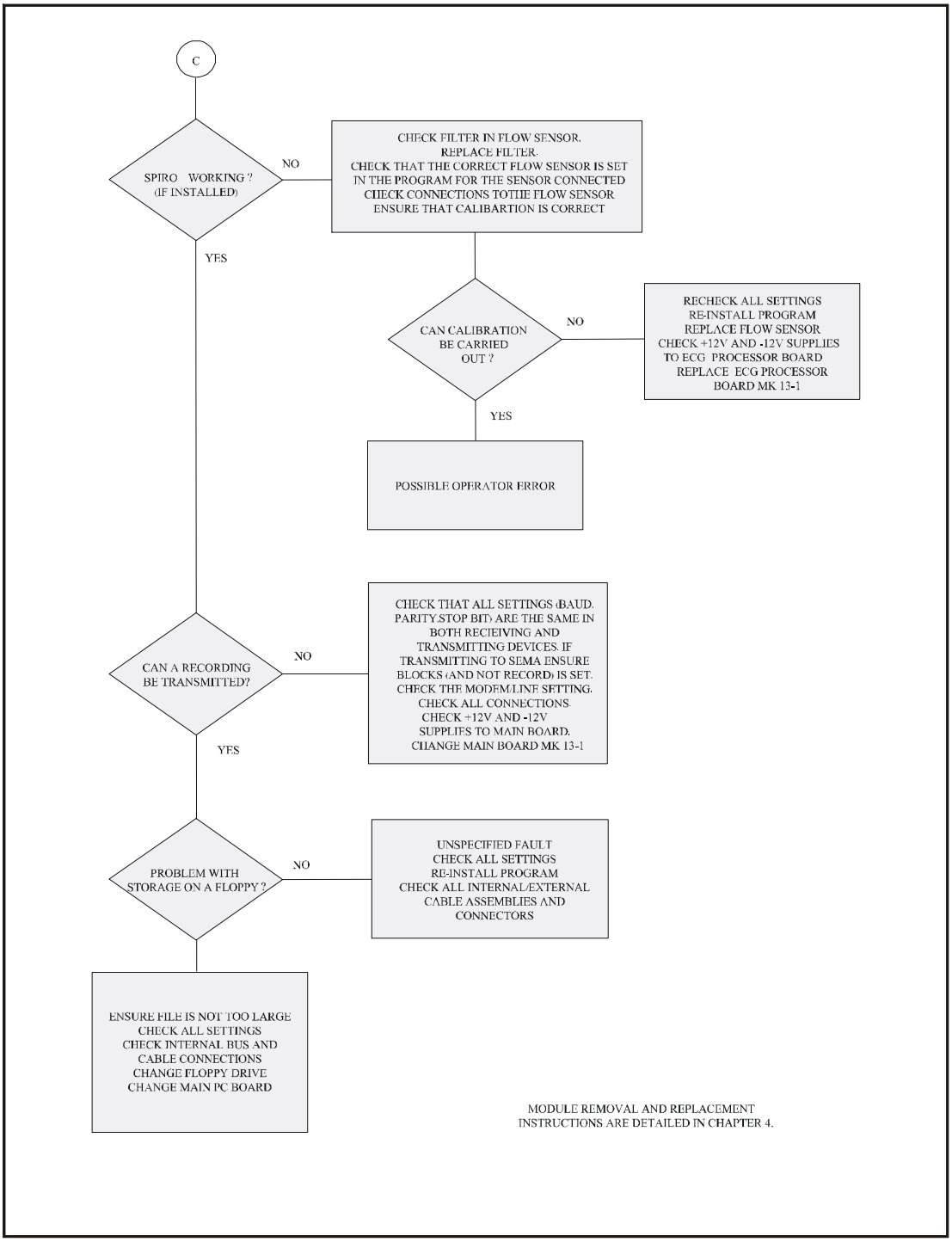
Fault Diagnosis Chart



Fault Diagnosis Chart



Fault Diagnosis Chart



Functional Check - Patient Screen

Check that all screens can be displayed and that they can all be exited with the "ESC" key:

- Patient Screen (starting screen)
- Search Screen (click on icon)

OK **ERROR**

Patient Screen

Select Patient / Recording - "Patient / Record Selection" displayed

OK **ERROR**

Search Recording, Screen changes to "Validation, Record Selection"

OK **ERROR**

Leave the application (i.e. return to Windows desktop)

Click on the program icon (just left of the text SDS200...) and select **Close** - OR - select the "OFF" X icon on the extreme top right of the screen - OR - click on the return icon twice.

OK **ERROR**

Shut Down

Leave the application as outlined above and shut down Windows as normal - OR - press the "ON/ OFF" dedicated key on the console. System shuts down after ca. 5 seconds.

OK **ERROR**

Hot keys function in Patient Screen

F3 =	Search	F8 =	Search by ID
F5 =	Print (laser)	F9 =	View recording
Shift + F5 =	Print format	F10 =	Select menu
F7 =	Search by Name		

OK **ERROR**

Functional Check - Patient Screen (cont.)

Resting ECG Acquisition

Connect a patient simulator to the CS-200.

Click on "RECG" - "Resting ECG" is displayed.

Click on "AUTO" to start an automatic ECG measurement.

After ca. 10 seconds the measurement is finished, the Patient screen is displayed and the ECG traces are printed out (if Direct Print is set in System Configuration / Resting ECG).

OK **ERROR**

When in the "Resting ECG" screen, click on "ManStart"

The printer starts printing the ECG traces. Select the "Stop" icon or press the "Stop" dedicated key on the console to stop the printer.

OK **ERROR**

Hot keys function in "Resting ECG" screen

F3 =	Manual Start	Shift + F5 =	Auto Start (format 2)
F4 =	Stop	F6 =	Filter ON / OFF
F5 =	Auto Start (format 1)	Shift + F6 =	Recenter

OK **ERROR**

Functional Check - Patient Screen (cont.)

Ex ECG Acquisition

Connect a patient simulator to the CS-200.

Connect exercise equipment, i.e. bicycle or treadmill, to the CS-200 if available.

Click on "Ex ECG" - "Ex ECG Acquisition" screen is displayed

Click on "Start" or press F7.

- Test icon changes to "Begin".
- After a few seconds click on "Begin" - icon changes to "Recover" (green)
- Click on "Recover" - colour changes to yellow.
- Wait for 20 seconds or click on "Recover" - icon changes to "End".
- Click on "End". -- Do you really want to leave test ? -- YES.
- Patient screen is displayed.
- Select a record and click on "View"
- Press Shift + F5 to define Print-out, press F5 to print on external laser printer.

OK ERROR

Hot keys function in "Ex ECG Acquisition" screen

F3 =	Manual Start	Shift + F6 =	Recenter
F4 =	Stop	F7 =	Next step of test
F6 =	Filter ON / OFF	F11 =	Input blood pressure
		Shift + F11 =	Input Symptoms

OK ERROR

Functional Check - Search and View Screens

Search Screen

When in the Patient Screen, select the "Search" icon. The "Validation, Record Selection" screen is displayed.

All available recordings are presented. Check the Search, Edit and Today functions.

OK ERROR

View Screen

Select a recording in the Patient or the Search screen. Click on the "View" icon.

Depending upon the kind of recording selected, the "View Resting ECG" or the "View Exercise ECG" screen is displayed.

OK ERROR

Software Installation / Update

There are three main software-controlled microprocessors in the CS-200:

on the PC main board	-	controlled by the SDS software,
on the ECG processor board	-	controlled by the ECG processing software,
on the power supply board	-	controlled by the printer software.

SDS Software

The original installation of the SDS software as well as later updates are performed in the same way. The old version is overwritten with the new one. If the previous version is much older than the new one, it is recommended to delete the resp. directories before the new version is installed.

1. Start the CS-200.
2. If the SDS-200 program has started, close the application and go back to the Windows 95 desktop.
3. Select Start / Run.
4. Insert the SDS-200 installation disk 1 into drive A.
5. Enter "A:\install" into menu Run and confirm with OK.
6. Follow the instructions on the screen including the insertion of disc 2 when prompted to do so.
7. Restart the system.
8. When the Windows 95 desktop is displayed, double-click on the SDS-200 icon to start the CS-200.

ECG Processing Software (System software)

Older units are updated by exchanging the EPROM. For newer units, from S/N 030.00409 and upwards, updating the ECG software is performed in the same way as the SDS software.

1. Start the CS-200.
2. If the SDS-200 program has started, close the application and go back to the Windows 95 desktop.
3. Select Start / Run.
4. Insert the ECG Firmware Update disk into drive A.
5. Enter "A:\FWup.exe" into menu Run and confirm with OK.
6. Follow the instructions on the screen.
7. Restart the system.
8. When the Windows 95 desktop is displayed, double-click on the SDS-200 icon to start the CS-200.
9. Check that the new version works properly.

Printer Control Software

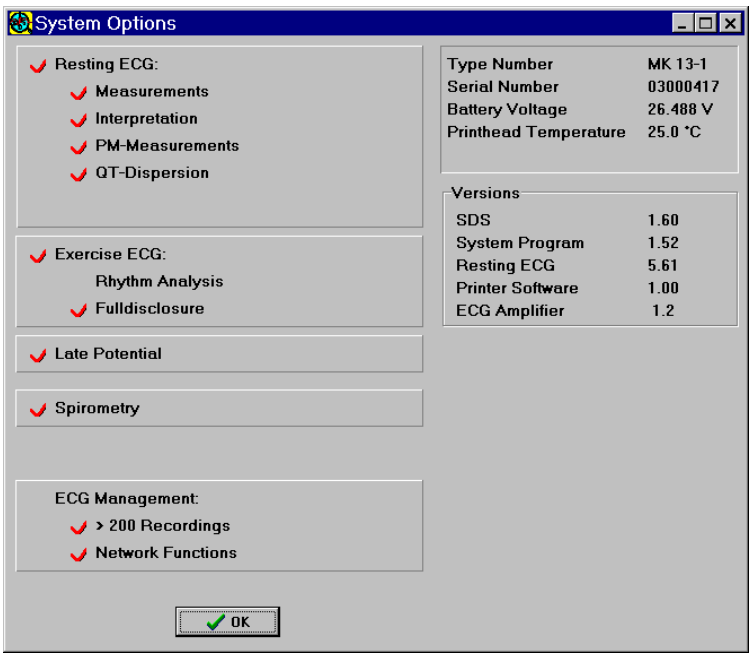
The printer control software is stored in an EPROM on the power supply board. It can be upgraded by exchanging the EPROM.

Software Options

All pure software options are already prepared in the instrument. They can be activated by entering an upgrade code.

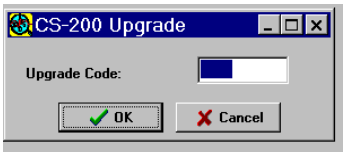
1. In the main menu, click on the "System" submenu and select "Settings / CS-200 / Show options".

2. The screen shows which options are available and which ones are activated.



3. Click OK to get back to the main menu.

4. In the "System" submenu, select "Settings / CS-200 / Set options". The CS-200 prompts you for an upgrade code.



5. Every CS-200 instrument has individual codes for each option, consisting of 7 numbers. This code number is released by Schiller AG, Sales Administration, when an order for the option is placed.

6. Enter the code and confirm with OK.

7. Check in the "System / Settings / CS-200 / Show options" that the option in question has been activated.

Remote Diagnosis

Remote Diagnosis and trouble-shooting is possible with the help of a special software program called pcANYWHERE. The CS-200 which is to be analysed (the host) can be remotely controlled by another PC, either via

1. **Network or**
2. **Modem.**

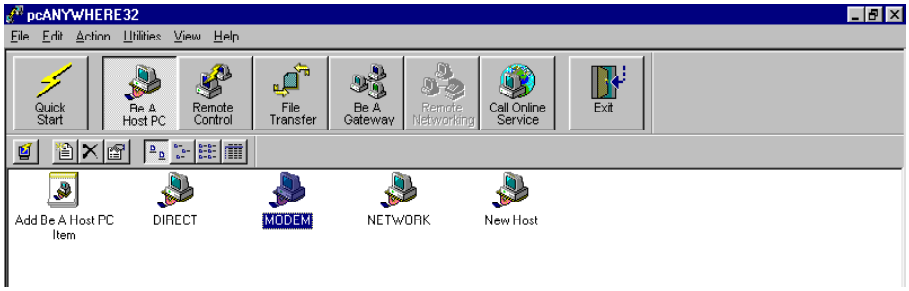
pcANYWHERE has to be installed and activated on both PCs.

1. Remote Control over Network

1.1 Host Settings

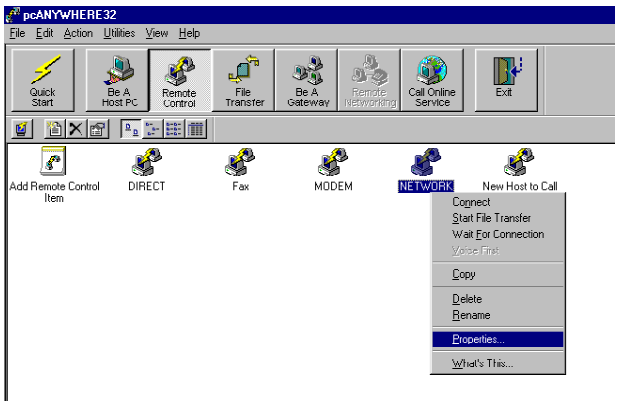
- On the CS-200, start the pcANYWHERE program and click on the "Be a Host" icon.
- Right-click on Network and chose Properties. Set the proper protocol. Your network administrator will tell you which protocol you are using.
- Put the host in stand-by by selecting "Launch Host" from the right-click menu, or "Wait for connection" from the action menu - or - just double-click on the Network icon.

Note: Right-click means activating the right key on the mouse !!



1.2 Remote PC Settings

- Set the servicemans PC for "Remote Control".
- Right-click on Network, chose properties and set the proper protocol.

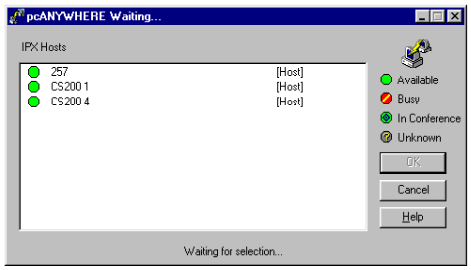


Remote Diagnosis (Network)

- Activate the remote control PC by clicking on "Connect" in the right-click menu or in the Action menu - or - just double-click on the Network icon.

Note: Right-click means activating the right key on the mouse !!

- **The hosts available on the network are shown.**



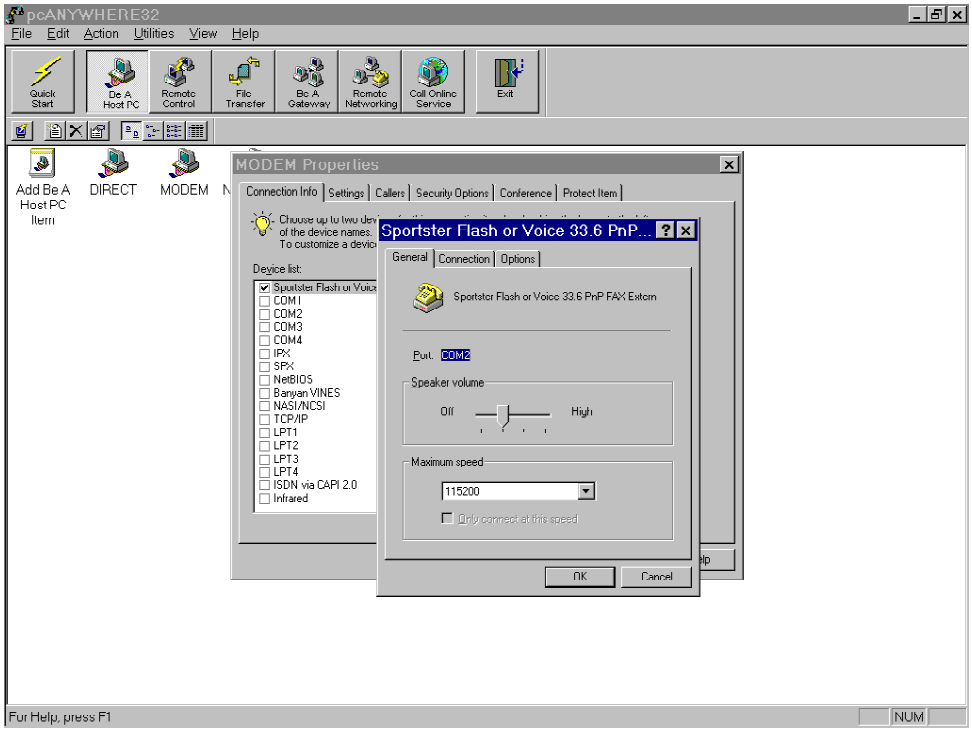
- Select the proper equipment. The screen first goes black, and then the screen of the host appears.
- You can now control the host with your own mouse and keyboard as if you were sitting in front of the unit.
- **Perform functional tests and trouble-shooting on the host as described earlier in this chapter.**

Remote Diagnosis (Modem)

2. Remote Control via Modem

2.1 Host Settings

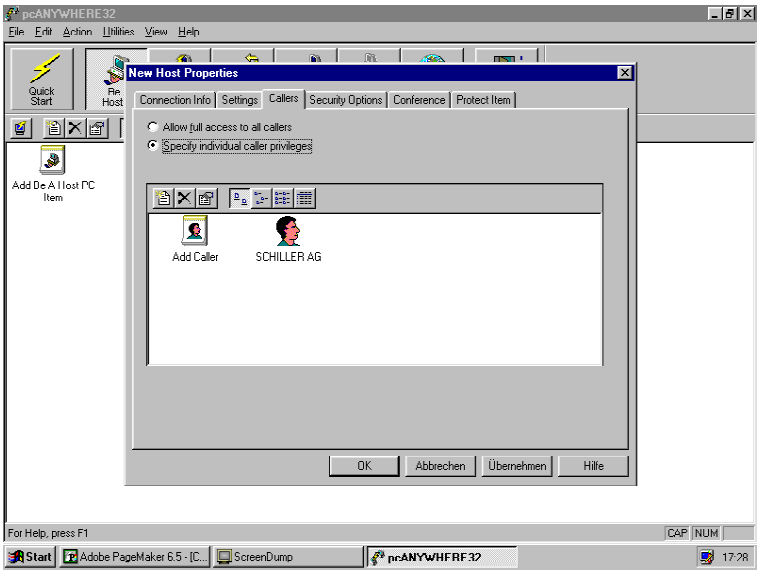
- Start pcANYWHERE, select "Be a Host PC", click on "Add Be a Host PC Item" and give the new item a proper name.
- Make sure that the right modem is specified, check the details and set the speed at 115 200 bps and data bits, parity and stop bits to 8, n, 1.



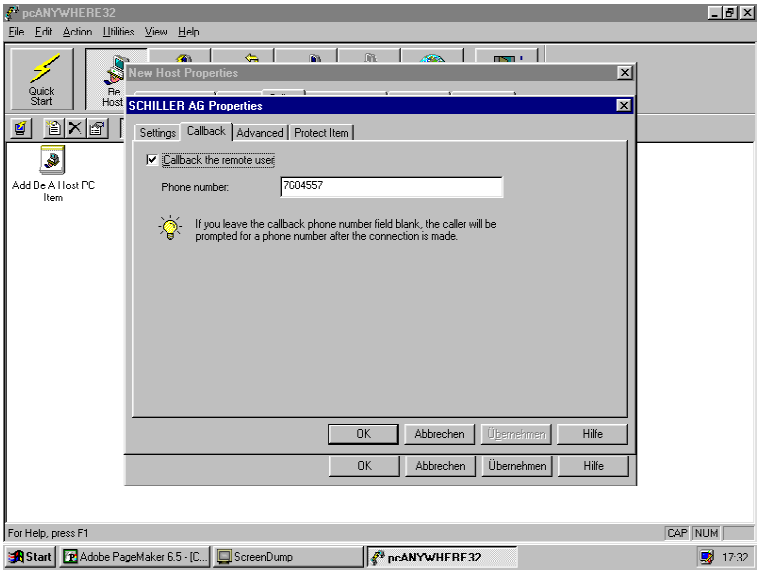
- Right-click on the new item and select Properties.
- Check the proper Settings and select Callers.

Remote Diagnosis (Modem) (cont.)

- "Specify individual caller privileges" and add a new caller (SCHILLER AG).
- Give the caller a name and a password.



- Right-click on the new caller and select properties.
- If the Callback feature has been agreed with the customer, select the tab "Callback" and enter the proper telephone number.



- Go back to pcANYWHERE main menu and "Launch Host" or "Connect" - or - just double-click on the new icon.
- "Waiting for connection..."

Remote Diagnosis (Modem) (cont.)

2.2 Remote PC Settings

- Select "Remote Control", click on "Add Remote Control Item" and give the new item a proper name.
- Make sure that the right modem is specified, check the details and set the speed at 115 200 bps and data bits, parity and stop bits to 8, n, 1. Enter telephone number to the host.

- Right-click on the new item and select Properties. Select the tab "Settings" and check that the telephone number to the host is properly entered.
- Go back to the pcANYWHERE main menu and double-click on the new item.
- "Connecting...". Modem is dialing the host.
- Host responds : "Enter your login name:____". Enter the name of the caller, which you added to the host earlier and confirm with Enter.
- "Enter Password:___". Type the corresponding password and confirm with Enter.
- If Callback has been activated, the connection is now broken and the screen shows : " Waiting for Host PC to perform callback."
- The host calls back and the connection is reestablished. The screen of the host appears.
- Select the SDS application and perform functional tests and trouble-shooting as described earlier in this chapter.
- To end the remote session, either click on the OFF X in the upper right corner or on the right-most icon "End remote control session".

For further details, please consult the Help function in pcANYWHERE.

System Failures

System blocked

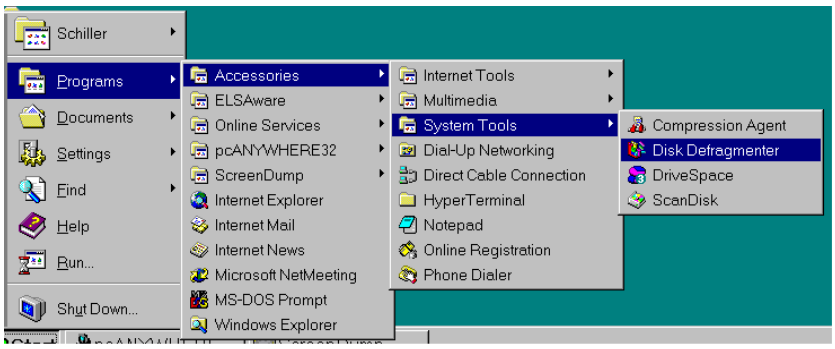
After certain operating or software failures, it can happen that the system blocks and no longer reacts to keyboard and mouse commands. In some cases an "Access Violation" error may be indicated. To solve the problem proceed as follows:

1. Press simultaneously CTRL + ALT + DELETE
2. Click on "End Task"
3. Select "Shut down the system"
4. Wait about a minute and then restart the computer

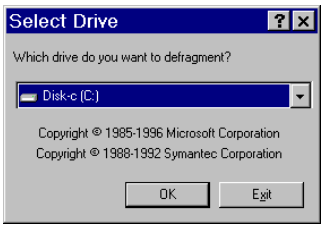
Defragmentation

Every now and then it is recommended to defragment the hard disk, especially when program files have been deleted or several errors have occurred. This will organise the memory position on the disk and make the system faster.

1. Click on "Start" and select "Programs / Accessories / System Tools / Disk Defragmenter"



2. Select Drive C: and Start Defragmentation



3. When defragmentation is complete, quit the defragmentation application

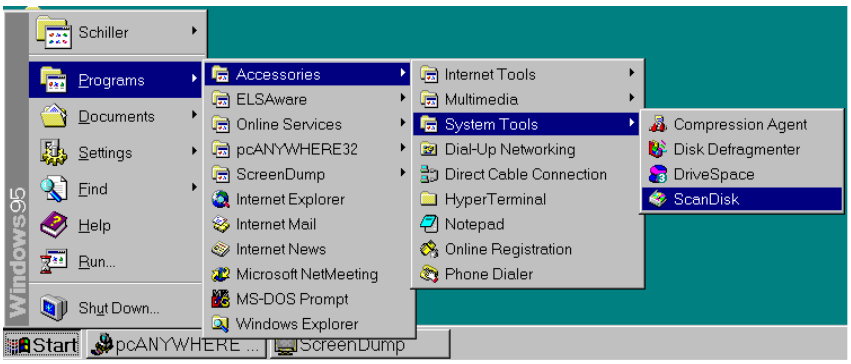
4. If errors found during defragmentation, run Scandisk (see below), otherwise restart SDS-200

Disk Errors

ScanDisk

When disk errors have occurred,or when, for example, the system was shut down without following the normal Windows procedures, it is recommended to run the program "ScanDisk". Newer versions of Windows 95 will do this automatically during a re-start.

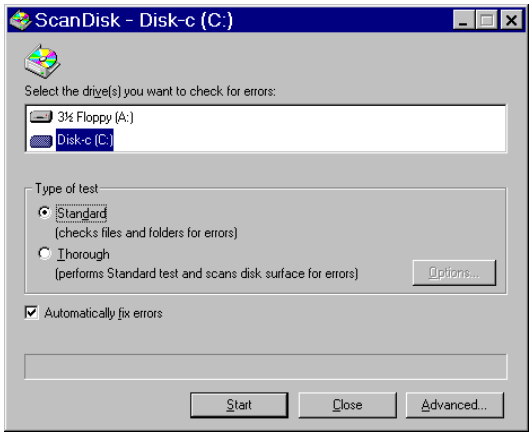
1. In the Windows 95 desktop, click on "Start" and select "Programs / Accessories / System Tools / ScanDisk".



2. Select Drive C: and mark the box "Automatically fix errors". There are two versions of the ScanDisk program:

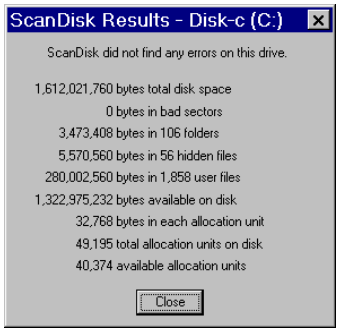
   - Standard This takes about 2 minutes and is normally sufficient.

   - Thorough This is recommended when several or severe errors have occurred. Can take up to 30 minutes.



Disk Errors (cont.)

3. ScanDisk reports any errors found.



4. Close this window and the previous one. You should now be back in the Windows desktop.
5. Re-start the SDS-200 application

Chapter 4
Physical Overview & Module Replacement

Contents

WARNING

DISCONNECT MAINS SUPPLY AND REMOVE MAINS CONNECTOR BEFORE COMMENCING ANY REMOVAL AND REPLACEMENT PROCEDURES

CAUTIONS

ELECTRO STATIC SENSITIVE DEVICES INSIDE - OBSERVE ELECTRO STATIC PRECAUTIONS

ONLY PERSONNEL WHO HAVE ATTENDED A SCHILLER CS-200 SERVICE TRAINING COURSE ARE AUTHORISED TO CARRY OUT ANY SERVICE PROCEDURES

WHEN CARRYING OUT ANY MAINTENANCE PROCEDURES ALWAYS PLACE THE UNIT ON AN EARTHED ANTISTATIC MAT.

PERSONNEL MUST BE EARTHED WHEN HANDLING ANY BOARDS OR COMPONENTS

ALWAYS USE AN ANTISTATIC BAG WHEN TRANSPORTING BOARDS OR COMPONENTS

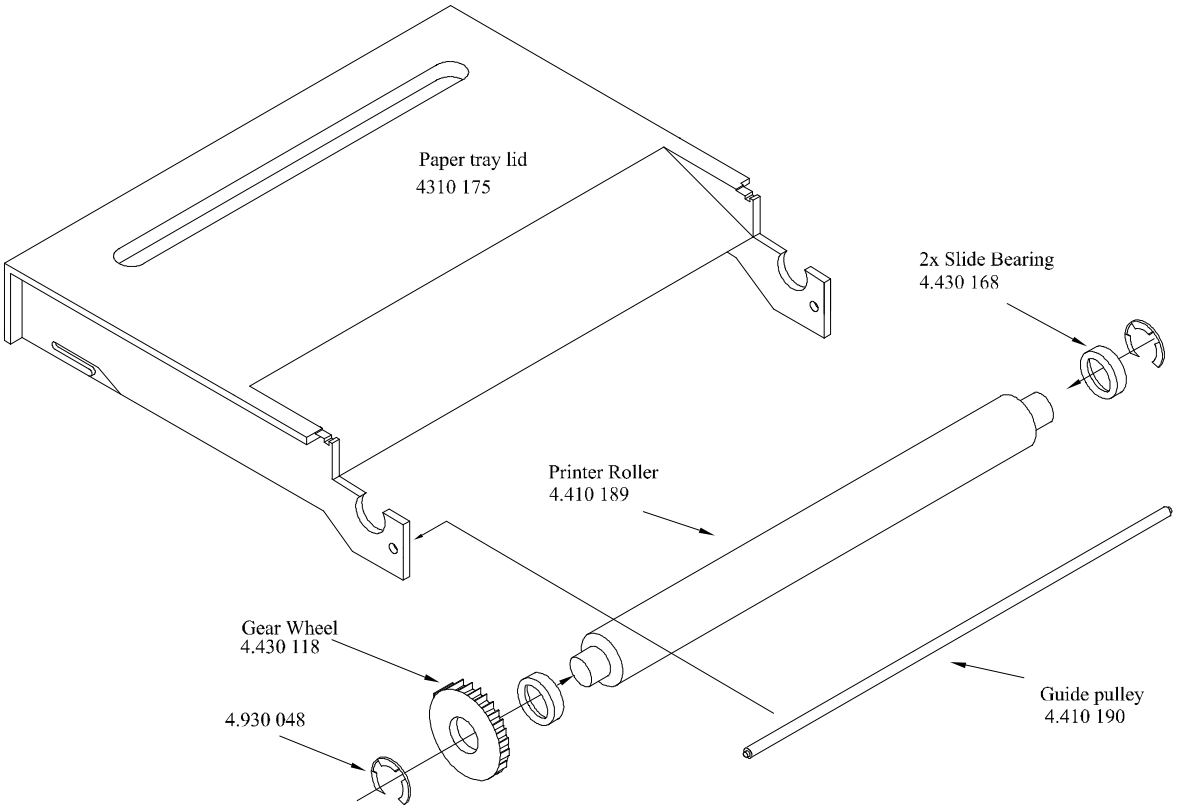
THE UNIT IS SUSCEPTIBLE TO ABRASION DAMAGE. TO PREVENT SCRATCHING, ALWAYS PLACE THE UNIT ON A SOFT, NON-ABRASIVE CLOTH WHEN CARRYING OUT MAINTENANCE PROCEDURES.

TAKE CARE NOT TO PLACE ANY STRAIN ON THE CONNECTING RIBBON CABLE WHEN REMOVING THE TOP ASSEMBLY . ENSURE THAT THE CABLE ASSEMBLY IS NOT CRIMPED OR TWISTED AND THAT THE TOP ASSEMBLY IS NOT PLACED ON THE CABLE ASSEMBLY.

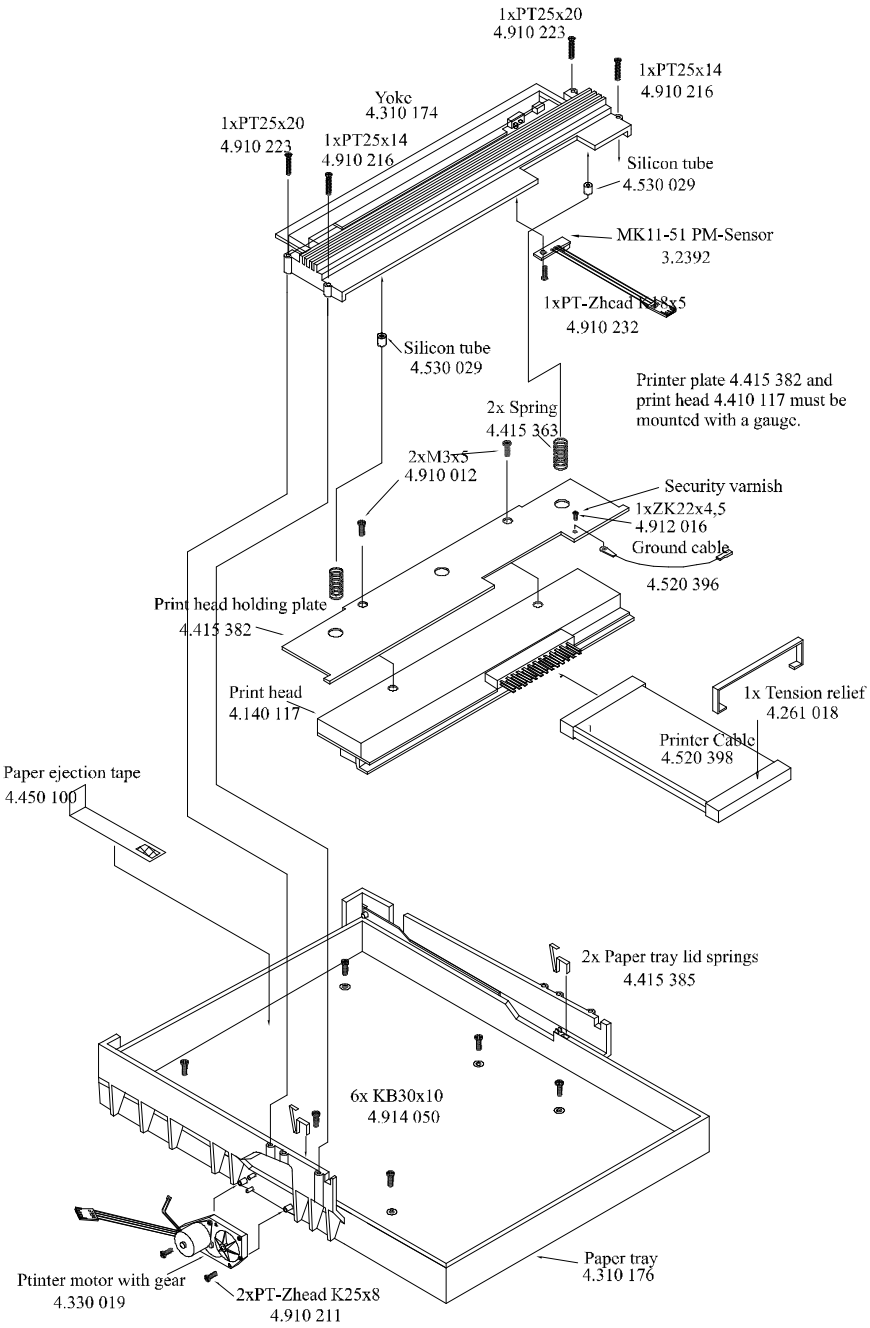
CARE MUST BE TAKEN WHEN REMOVING AND REPLACING CONNECTORS. NEVER USE FORCE. NEVER STRAIN THE CABLE ASSEMBLIES.

THE PROCEDURAL STEPS GIVEN FOR EACH MODULE MUST BE FOLLOWED IN THE ORDER GIVEN.

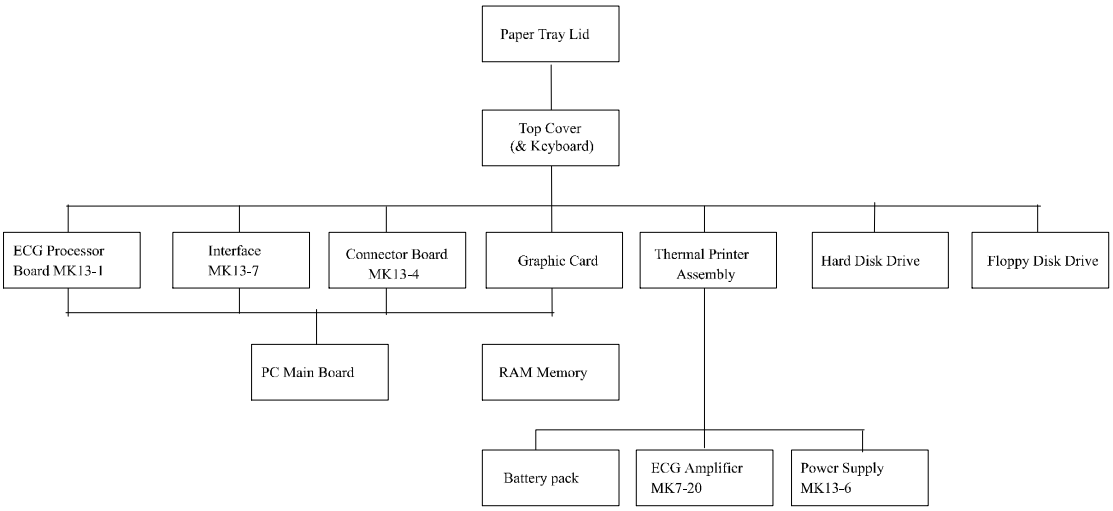
CS-200 Exploded View Paper Feed

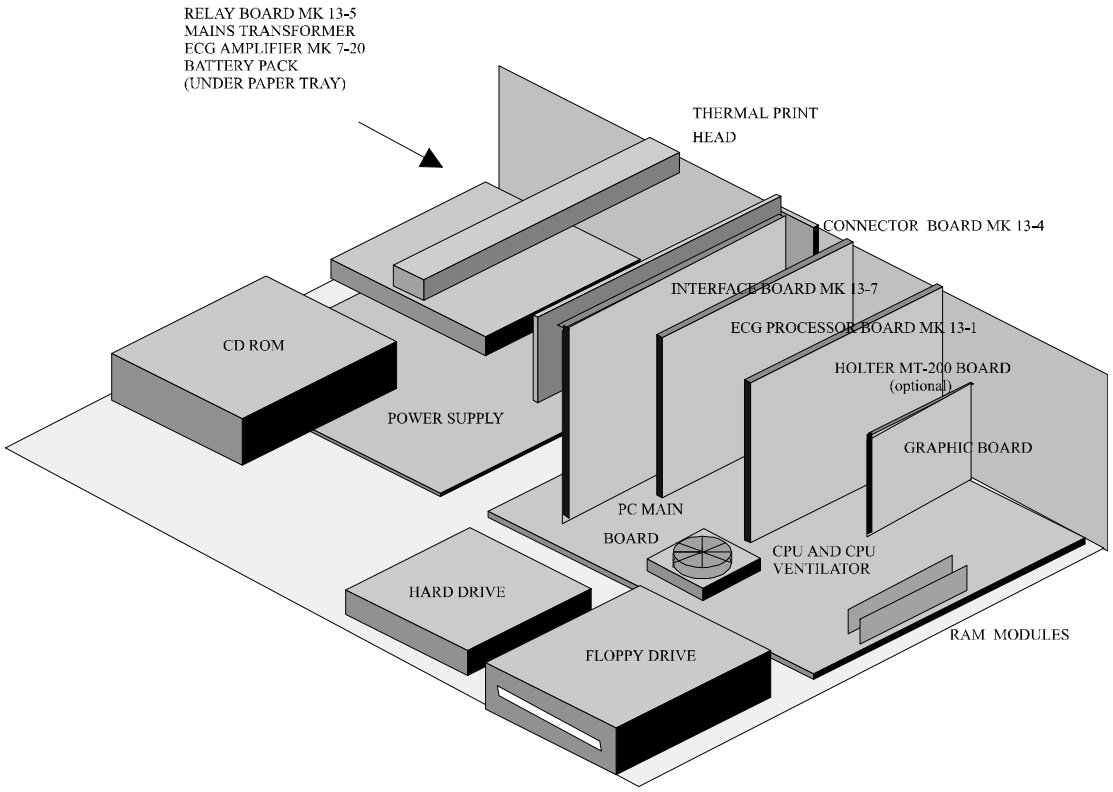


CS-200 Exploded View Printer assembly



Module Replacement





Module Replacement (cont.)

Removing the paper tray cover and the top cover of the CS-200 gives access to almost all replaceable modules, the rest are accessible after removing the thermal printer assembly (see chart on previous page). Procedures how to dismantle and assemble the major modules are explained in the following pages.

Overview

1. Dismantle / Assemble Paper Tray Lid
2. Dismantle / Assemble Top Cover
3. Dismantle / Assemble Printer
4. Dismantle / Assemble Printhead
5. Exchange Battery
6. Dismantle / Assemble ECG Amplifier MK 7-20
7. Dismantle / Assemble ECG Processor MK13-1
8. Dismantle / Assemble Graphic Card
9. Dismantle / Assemble Floppy Drive
10. Dismantle / Assemble CD-ROM Drive
11. Dismantle / Assemble Hard Disk
12. Dismantle / Assemble Power Supply
13. Dismantle / Assemble CPU Ventilator
14. Dismantle / Assemble CPU
15. Exchange Working Memory (RAM)
16. Dismantle / Assemble PC Main board

Top Cover

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Note: *In order to loosen the screws holding the top cover, a special screwdriver is required. (This screwdriver can be purchased from SCHILLER AG with the* ***Article Nr. 4.950.153****)*

Removing the Top Cover

1. Switch off CS-200 and disconnect mains supply
2. Remove paper tray lid and paper
3. Remove the four special screws on the back with the special screwdriver
4. Remove the two screws on the bottom front cover
5. Carefully remove the top cover
6. Disconnect the plug to the console keys
7. Disconnect the plug to the keyboard and to the trackball
8. Remove the cable from the cable holders
9. Remove the cover

Replacing the Top Cover

1. Switch off CS-200 and disconnect mains supply
2. Pull the plug to the console keys through the empty space on the holder and connect to the interface card
3. Connect keyboard plug (marked with KB on the cable) and trackball plug (marked with PD)
4. Place the cables into the cable holders
5. Carefully assemble top cover onto the case
6. Replace the four special screws on the back with the special screwdriver
7. Replace the two screws on the bottom front cover
8. Replace paper and paper tray lid

Thermal Printer

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Removing the Thermal Printer

1. Switch off CS-200 and disconnect the mains power supply - remove the mains connector.
2. Remove paper tray lid and paper
3. Dismantle top cover
4. Disconnect printhead cable, papermark sensor cable and printmotor cable from the interface card.
5. Disconnect ground connection to the printhead from the cover
6. Remove the six screws from the paper tray
7. Remove the printer assembly

Caution Ensure that the printer motor is not damaged when the printer assembly is removed

Replacing the Thermal Printer

1. Switch off CS-200 and disconnect mains supply
2. Assemble printer on printer plate first ensuring that the printer motor is inserted in the place of the carrier.
3. Replace the six screws on the paper tray
4. Plug in ground connection to the printhead at the cover
5. Plug in connection cable to the printhead, papermark sensor and printer motor at the interface card
6. Assemble top cover
7. Place paper and paper tray lid

Printhead

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Removing the Printhead

1. Switch the CS-200 off and disconnect mains supply
2. Remove paper tray lid and paper
3. Dismantle top cover
4. Disconnect connection cable from the printhead, printer motor and papermark sensor at the interface card
5. Disconnect ground connection from the printhead to the cover
6. Remove the four screws on the yoke

Caution: The yoke pushes onto the printhead with two springs. When the yoke is loosened, it springs away

7. Remove printhead and yoke

Replacing the Printhead

1. Assemble the printhead to the yoke, insert the springs from the yoke into the spring recesses in the printhead
2. Lightly push the printhead and yoke together and ensure that the printhead is inserted through the slit in the yoke so that the metal printhead is lying on the top of the yoke slit.
3. Keep holding the yoke and printhead together and place them in the cam guide on the printer cover.
4. Secure the four screws
5. Plug in Ground connection to the printhead at the cover
6. Plug in connection cable to the printhead, printer motor and papermark sensor at the interface card
7. Replace paper and paper tray lid
8. Switch on CS-200 and test printing quality

Battery

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Exchange Battery

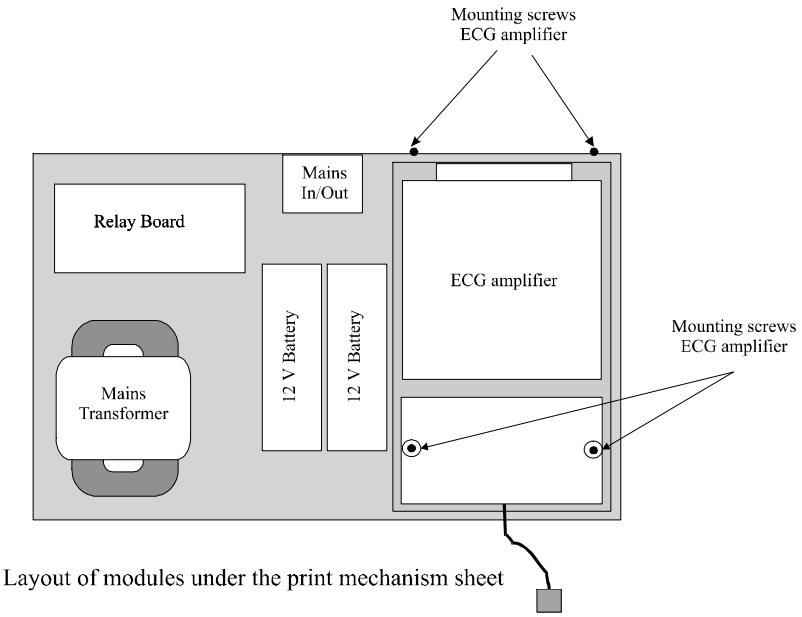
1. Switch off CS-200 and disconnect mains supply - remove mains plug
2. Remove paper tray lid and paper
3. Remove top cover
4. Disconnect connection cable from the printhead, printer motor and paper mark sensor at the interface card
5. Disconnect ground connection for the printhead from cover
6. Remove the six screws from the paper tray
7. Remove the printer assembly
8. Remove the two screws for the print mechanism sheet at the back of the covering
9. Remove the two screws for the print mechanism sheet at the carrier plate
10. Remove the print mechanism sheet. In order to remove the print mechanism sheet, the back covering should be pushed lightly towards the back.
11. Change Batteries
12. Insert print mechanism sheet
13. Replace the four screws for the print mechanism sheet
14. Replace the printer assembly and fasten the six screws in the paper tray
15. Reconnect the connection cable to the printhead, papermark sensor and printer motor at the interface card
16. Replace paper and paper tray lid
17. Reconnect the console keys cable to the interface card
18. Switch on CS-200 using battery operation (mains plug not connected!)
19. Using the “Stop key” on the additional keyboard, advance the paper in order to check proper functioning
20. Re-attach top cover

ECG Amplifier MK 7-20

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Dismantle ECG amplifier MK 7-20

1. Switch off CS-200 and disconnect mains supply - remove mains plug
2. Remove paper tray lid and paper
3. Remove top cover
4. Disconnect connection cable from the printhead, printer motor and paper mark sensor at the interface card
5. Disconnect ground connection for the printhead from cover
6. Remove the six screws from the paper tray
7. Remove the printer assembly
8. Remove the two screws for the print mechanism sheet at the back of the covering
9. Remove the two screws for the print mechanism sheet at the carrier plate
10. Remove the print mechanism sheet. In order to remove the print mechanism sheet, the back covering should be pushed lightly towards the back.
11. Disconnect the cable to the power suppl board (P2)
12. Loosen the two screws visible on the top of the ECG amplifier
13. Remove the two screws on the back panel holding the amplifier to the case
14. Remove the ECG amplifier



Layout of modules under the print mechanism sheet

ECG Amplifier MK 7-20 (cont.)

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Assemble ECG amplifier MK 7-20

1. Insert the new ECG amplifier. Fit the connector through the hole in the back panel.
2. Replace the two screws on the back panel
3. Secure the two screws on the top of the ECG amplifier
4. Connect the ECG amplifier to the power supply board (P2)
5. Insert print mechanism sheet
6. Replace the four screws for the print mechanism sheet
7. Replace the printer assembly and fasten the six screws in the paper tray
8. Reconnect the cables for the printhead, papermark sensor and printer motor to the interface board
9. Replace paper and paper tray lid
10. Reconnect the console keys cable to the interface card
11. Switch on the CS-200
12. Make new Resting ECG recording and test correct function
13. Switch off CS-200 and reassemble

ECG Processor MK 13-1

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Dismantle ECG Processor MK 13-1

1. Switch off CS-200 and disconnect mains supply - remove mains plug
2. Remove paper tray lid and paper
3. Remove top cover
4. Dismantle the shield covering the PC part
5. Disconnect connection cable to the Connector board MK 13-4 from the insert case “P18” (release safety shackle with tweezers)
6. Disconnect connection cable to power supply from insert case “P1” (release safety shackle with tweezers)
7. Remove screw from slot plate
8. Pull ECG processor card from the slot holder

Assemble ECG Processor MK 13-1

NOTE: *Before assembly, the DIP switch “J1-J4” and the jumper “JUMP1” has to be compared with the card which is to be exchanged, and has to be adjusted to the same settings.*

1. Place ECG processor card into the ISA slot
2. Replace screw for the slot holder
3. Connect the connection cable to the power supply (“P1”) and to the Connector board MK 13-4 (“P18”) on the ECG processor card
4. Replace the safety shackles of the two plugs
5. Assemble the shield covering the PC part
6. Assemble top cover
7. Assemble paper and paper tray lid
8. Switch on CS-200
9. Make new Resting ECG recording and test correct function

Graphic Card

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Removing the Graphic Card

1. Switch off CS-200 and disconnect mains supply - remove mains plug
2. Remove paper tray lid and paper
3. Remove top cover
4. Dismantle the shield covering the PC part
5. Disconnect monitor plug on the back panel
6. Remove screw from the slot plate
7. Pull graphic card out of the PCI - or AGP - slot

Replacing the Graphic Card

1. Push graphic card into the PCI - or AGP - slot
2. Replace screw for the slot holder
3. Reconnect monitor plug to the back panel
4. Reassemble the shield over the PC part
5. Reassemble top cover
6. Reassemble paper and paper tray lid
7. Switch on CS-200 and test the graphic card for its correct function

Graphic Card Settings

1. Start Windows 95
2. Select Start / Settings / Control Panel
3. Double-click on Display and set the following parameters in menu "Display Properties":

Background:	Pattern:	= none
	Wallpaper	= none
	Display	= centre
Screen Saver:	Screen Saver	= none
Appearance:	Scheme:	= Windows-Standard (large)
	Item:	= Desktop
Settings:	Colour Palette:	= 256 Colours
	Desktop area:	= 1024 x 768 Pixel
	Font size:	= Small Fonts

4. Select "Advanced Properties" under the tab "Settings"

   Set the following parameters in Menu "Advanced Display Properties"

   Adaptor Type: = ELSA Winner 1000 Trio/V

   or Diamond Stealth 64 DRAM PC video 2001 (older version)

   or Diamond Stealth 64 DRAM PCI (older version)

Note: If in doubt, open the unit and check what is written on the graphic card or contact Schiller AG. Based on the serial number of the equipment Schiller AG can tell you which graphic adapter is installed.

Monitor Type: = Sony Multiscan 15sf

or Sony 100es (15")

or Sony 100sx (15")

or Sony Multiscan 17sf

or Sony 200sx (17")

or user defined

Floppy Disk Drive

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Disassemble Floppy Drive

1. Switch off CS-200 and disconnect mains supply - remove mains plug
2. Remove paper tray lid and paper
3. Remove top cover
4. Dismantle the front shield covering floppy drive, hard drive and CD-ROM
5. Disconnect the floppy cable and the mains cable from the disk drive
6. Remove the four screws from the floppy holder
7. Remove the disk drive with the floppy holder

Assembling Floppy Drive

1. Remove the four screws from the floppy holder
2. Mount the new disk drive onto the floppy holder
3. Screw the disk drive with the floppy holder onto the cover
4. Plug floppy cable and power cable into the disc drive. (The floppy cable is marked on one side. Pin 1 is on the marked side of the cable. In the disk drives, Pin 1 is usually on the side that is closer to the power plug. Most disk drives also have an empty space on the bottom of the floppy plug, which marks Pin 1)
5. Connect the console keys cable at the interface card
6. Switch on CS-200
7. Insert an empty diskette into the disk drive and format it (by formatting you carry out the most reliable function test).
8. Switch off CS-200 and reassemble

CD-ROM Drive

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Disassemble CD-ROM Drive

1. Switch off CS-200 and disconnect mains supply - remove mains plug
2. Remove paper tray lid and paper
3. Remove top cover
4. Dismantle front shield
5. Disconnect the data cable and the mains cable from the CD-ROM drive
6. Remove the four screws from the CD-ROM drive holder
7. Remove the CD-ROM drive with the drive holder

Assembling CD-ROM Drive

1. Remove the four screws from the CD-ROM drive holder
2. Mount the new CD-ROM drive onto the drive holder
3. Screw the CD-ROM drive with the drive holder onto the cover
4. Plug data cable and power cable into the CD-ROM drive. (The data cable is marked on one side. Pin 1 is on the marked side of the cable. In the CD-ROM drives, Pin 1 is usually on the side that is closer to the power plug.)
5. Connect the console keys cable at the interface card
6. Switch on CS-200 and test correct function
7. Switch off CS-200 and reassemble

Hard Disk Drive

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Removing the Hard Disk

1. Switch off CS-200 and disconnect mains supply - remove mains plug
2. Disconnect all cables on the back
3. Remove paper tray lid and paper
4. Remove top cover
5. Dismantle the shield covering the PC part
6. Dismantle front shield
7. Disconnect power cable from the power source (P6)
8. Disconnect data cable from HD
9. Release the two screws on the HD holder
10. Remove HD from the casing

Installing a Hard Disk

1. Place HD into the HD casing
2. Assemble HD holder
3. Connect data cable to HD
4. Connect power cable to power supply (P6)
5. Connect console keys cable to the interface card
6. Switch CS-200 on and test correct function
7. Switch CS-200 off and reassemble

Power Supply Board

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Removing the Power Supply Board

1. Switch off the CS-200 and disconnect mains supply - remove mains plug
2. Disconnect all cables on the back panel
3. Remove paper tray lid and paper
4. Remove top cover
5. Dismantle the shield covering the PC part
6. Dismantle front shield
7. Dismantle printer mechanism panel (see „Exchange Battery“)
8. Dismantle Hard Disc
9. Dismantle CD-ROM drive

   On the Power Supply board MK 13-6 disconnect the following connections:

10. transformer cable (P11)
11. relay board cable (P10)
12. battery cables (P12 and P15)
13. ECG amplifier board cable (P2)
14. reset cable (P38)
15. interface board cable (P17)
16. ECG processor board cable (P1)
17. DC supply cables to floppy drive (P4), CD-ROM (P5), hard disk (P6), CPU ventilator (P7) and PC main board (P8)
18. ventilator cable (P9)
19. Remove the screws from the power supply board
20. Remove power supply board

Power Supply Board (cont.)

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Inserting a Power Supply Board

1. Place power supply into the casing and replace screws

   On the Power Supply board MK 13-6, reestablish the following connections:

2. ventilator cable (P9)
3. DC supply cables to floppy drive (P4), CD-ROM (P5), hard disk (P6), CPU ventilator (P7) and PC main board (P8)
4. ECG processor board cable (P1)
5. interface board cable (P17)
6. reset cable (P38)
7. ECG amplifier board cable (P2)
8. battery cables (P12 and P15)
9. relay board cable (P10)
10. transformer cable (P11)
11. Assemble CD-ROM drive
12. Assemble Hard Disc
13. Assemble printer mechanism plate with the printer (see „Exchange Battery“)
14. Connect all cables to the back panel
15. Connect the console keys cable to the interface card
16. Switch the CS-200 on and test correct function
17. Switch CS-200 off and reassemble

CPU Ventilator

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Removing the CPU Ventilator

1. Switch off the CS-200 and disconnect mains supply - remove mains plug and all other connectors on the back panel
2. Remove paper tray lid and paper
3. Remove top cover
4. Dismantle the shield covering the PC part
5. Dismantle front shield
6. Remove fixing spring in the middle of the CPU
7. Pull ventilator upwards and out
8. Disconnect DC supply cable from power supply (P7)

Installing a CPU Ventilator

1. Spread heat conduction paste onto the cooling element of the new ventilator
2. Set the ventilator onto the CPU (The DC supply cable is towards the hard disk drive)
3. Push fixation spring through the centre of the cooling element and push downwards until you hear the spring click into place
4. Plug the DC supply cable into the power supply (P7)
5. Connect console keys cable to the interface card
6. Switch CS-200 on and check the CPU Ventilator for its proper functioning
7. Switch off CS-200 and reassemble it

CPU

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Removing the CPU

1. Switch off the CS-200 and disconnect mains supply - remove mains plug and all other connectors on the back panel
2. Remove paper tray lid and paper
3. Remove top cover
4. Dismantle the shield covering the PC part
5. Dismantle front shield
6. Disconnect the DC supply for the PC main board from the power supply (P8)
7. Dismantle CPU Ventilator
8. Note position of Pin 1 from CPU (slanted corner of the CPU)
9. Loosen the ZIF handle out of its fixation by lightly pushing it to the side
10. Set ZIF handle at a right angle, which will set free the CPU
11. Carefully remove the CPU with two fingers and ensure that the connection legs are not being bent.
12. Put CPU into the prepared, conducting sponge, to ensure that it is not damaged

CPU (cont.)

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Note: *Before assembling the new CPU, the data sheets of the old and the new CPU have to be compared. It is important to note:*

the CPU voltage

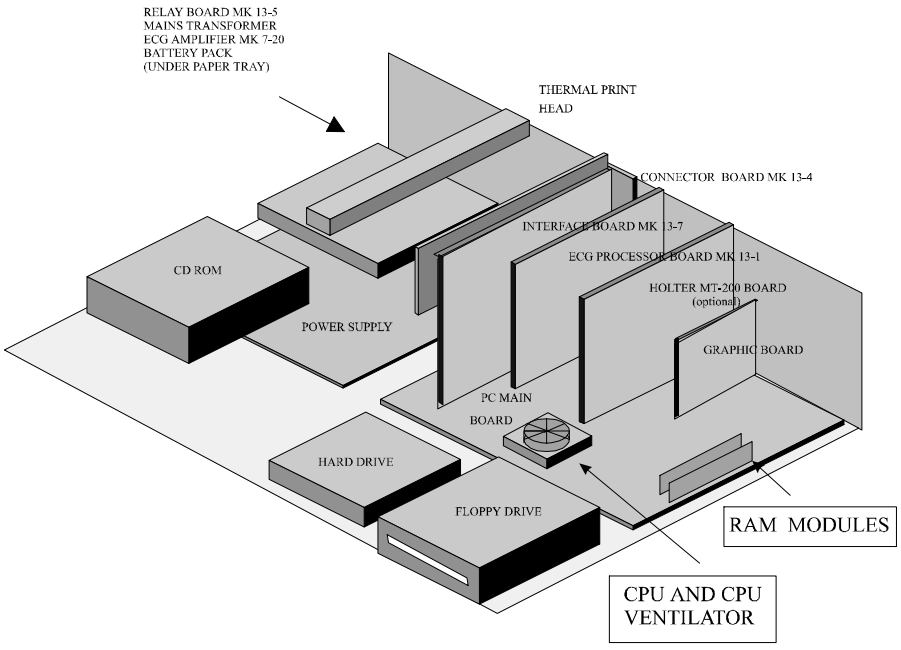
the clock frequency

the processor type

Note: Any changes have to be set on the main board using jumpers (if applicable). The jumper settings can be found on the data sheet of the main board. ***If these settings are incorrect, the CPU could be destroyed.*** *Newer main boards are automatically configured, i.e. no jumper settings are necessary.*

Installing a new CPU

1. Set the new CPU into the CPU frame. Pin 1 of the CPU and of the frame have to be conform. In the frame, a hole is missing in the outer row of holes, this marks Pin 1. On the CPU, Pin 1 is marked by the slanted corner.
2. Ensure that all legs are straight and are set correctly in the frame.
3. Push the ZIF handle down until it snaps into the fixation.
4. Reassemble the CPU ventilator
5. Connect the DC supply for the PC main board at the power supply (P8).
6. Plug in the console keys cable to the interface card
7. Switch on CS-200 and check functionality
8. Switch off CS-200 and reassemble



Working Memory (RAM)

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Removing memory modules (RAM)

1. Switch off the CS-200 and disconnect power supply - remove mains plug and all other connectors on the back panel
2. Remove paper tray lid and paper
3. Remove top cover
4. Dismantle the shield covering the PC part
5. Dismantle Graphic Card
6. Disconnect the cables “COM1”, ”COM2”, ”P1”, ”FDC1”, ”IDE1”, "IDE2" and the PC main board DC supply cable from the main board (two connectors !)
7. Dismantle the Memory SIMM Module. The SIMMs are in plug-in sockets and are attached with a clamp which clicks into the round fixation holes on the side of the module. These clamps have to be carefully bent backwards with a simultaneous upwards pressure. The modules thereby detach themselves from the fixation. It is best to take the modules out from back to front

Replace memory modules (RAM)

1. Place the new SIMM modules. It is best to place the modules from front to back. The modules have to be placed into the sockets sideways and then pushed slightly to the front until the fixation clamps click into place.
2. Connect the cables “COM1”, ”COM2”, ”P1”, ”FDC1”, ”IDE1”, "IDE2" and the PC main board DC supply cable to the main board (Ensure the correct polarity for the DC supply cable. The two cables both have a black mark on one side. These black sides have to be lying against one another in the centre of the plug.)
3. Assemble the graphic card
4. Connect the console keys cable to the interface card
5. Switch CS-200 ON
6. The CS-200 has to start correctly, without any error message
7. Switch CS-200 off and reassemble

PC Main Board

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Removing the PC Main Board

1. Switch the CS-200 off and disconnect mains supply - remove mains plug and all other connectors on the back panel
2. Remove paper tray lid and paper
3. Remove top cover
4. Dismantle the shield covering the PC part
5. Dismantle front shield
6. Dismantle all insert cards
7. Disconnect the cables “COM1”, ”COM2”, ”P1”, ”FDC1”, ”IDE1”, "IDE2" and the PC main board DC supply cable from the main board (two connectors !)
9. Disconnect the plugs for the PC Keyboard (P35A) and the Trackball (P36A) from the interface board
10. Disconnect the DC supply cable for the CPU Ventilator (P7) from the power supply board
11. Disconnect the Speaker Cable (J18) from the PC main board (if speaker is installed)
12. Remove CS-200 from the trolley
13. Remove the six screws holding the PC main board
14. Remove the PC main board from the case

PC Main Board (cont.)

OBSERVE WARNINGS AND CAUTIONS ON PAGE 3

Replacement of PC Main board

Note: *Before assembling the CPU and the working memory, the data sheets of the main board, the memory chips and of the CPU have to be compared. Thereby you should note :*

the CPU frequency

the clock frequency

the processor type

the memory chip type

Any changes have to be set on the main board using jumpers (if applicable).. The jumper settings can be found on the datasheet of the main board. ***If these settings are incorrect, the CPU, the main board and the working memory could be destroyed.***

1. Set jumpers on the PC main board as described in Main Board Data Sheet (if applicable)
2. Remove working memory (RAM) from the old PC main board and set it into the new board in the same order
3. Remove CPU with the ventilator from the old board and place it on the new board
4. Disconnect the Trackball and the PC Keyboard connection cables from the old board and plug them into the new board
5. Place the new board into the case with the ground plate
6. Fasten the PC main board with the six screws
7. Connect the speaker cable (J18) to the PC main board (if speaker is installed)
8. Connect the plugs for the PC-Keyboard (P35A) and the Trackball (P36A) to the interface board
9. Connect the mains cable for the CPU Ventilator (P7) to the power supply
10. Connect the cables “COM1”, ”COM2”, ”P1”, ”FDC1”, ”IDE1”, "IDE2" and the PC main board DC supply cable to the main board (Ensure the correct polarity for the DC supply cable. The two cables both have a black mark on one side. These black sides have to be lying against one another in the centre of the plug.)
11. Replace all insert cards into the same slots as they occupied before
12. Set the CS-200 onto the trolley
13. Connect the cables to the back
14. Connect the console keys cable to the interface card
15. Switch on the CS-200 and test its correct function
16. Switch off the CS-200 and reassemble the unit

Chapter 5
Spare Parts

Contents

Ordering Information

Your local representative stocks all the disposables and accessories available for the CS-200. In case of difficulty or to obtain the address of your local dealer, please contact the head office. Our staff will be pleased to help process your order or to provide any details for all SCHILLER products.

The address for advice is:

SCHILLER AG

Sales Department (Order Processing)

Altgasse 68

6340 Baar

Switzerland

Phone Number: ***+ (41) 41 766 42 42***

Fax Number: ***+ (41) 41 761 08 80***

When ordering, state that the order is for a CS-200 unit and provide the following:

- Part Title
- Part Number
- Your Address

Service Department

If you need help from our service engineers, please contact the following number:

Fax Number: ***+ (41) 41 761 03 34***

If you contact us by fax, be sure to provide the following information:

- Serial Number for your CS-200
- Software versions for SDS, system, printer and options
- accessories used, model and cable number

ECG System

DESCRIPTION	PART NUMBER
Cardiovit CS-200 Standard system with Windows based software	***0. 030 000***

- alphanumeric PC keyboard with trackball and mouse (with EMC filter)
- 3 1/2`` 1.44 MB floppy drive
- 1.6 GB Harddisk
- high resolution 15" colour monitor
- transport cart
- thermal printer
- battery and built in charger for 3 minutes emergency use
- RS-232 and parallel interfaces
- DC input/output
- data I/O interface
- analog interface
- mains cable
- operating manual

Software

- SCHILLER resting ECG software with 15 simultaneous leads (12 channel ECG)
- SCHILLER ECG measurement software M
- data management software for 200 recordings
- pacemaker detection software

Standard Accessories Resting ECG 1	***2. 000 048***

- 10 - lead patient cable banana plug with detachable leads
- 10 snap clip adapters
- 500 SCHILLER tabs resting ECG electrodes
- 1 pack of recording paper
- cardiopreps (bag of 50)

Standard Accessories Resting ECG 2	***2. 000 049***

- 10 - lead patient cable banana plug with detachable leads
- 4 extremity electrodes
- 6 suction cap electrodes
- 1 ECG electrode gel (100ml)
- 1 pack of recording paper

Recording Paper	***2. 157 017***

thermoreactive Z-folded, red, 1 packet, length 60m, width 210mm

ECG System Options

DESCRIPTION	PART NUMBER
10-lead patient cable 2 m	2. 400 034
- with detachable leads; banana plugs	
10-lead patient cable 2 m	2. 400 048
- with detachable leads, clips	
10-lead patient cable 3.5 m	2. 400 055
- with detachable leads, banana plugs	
10-lead patient cable 3.5 m	2. 400 056
- with detachable leads, clips	
13-lead patient cable 2 m	2. 400 031
Patient cables test pieces	2. 100 081
- set of ten pieces	
Adapter for snap on fastener	2. 410 041
Potential equalisation (Ground) cable; 5 m	2. 310 005
Mains (Power) cable	2. 300 005
High Resolution 17`` colour monitor	2. 200239
PC Mouse	2. 100 239
- PC Mouse	
- Filter Plug	
- mouse pad	
Printer - Laser HP 6P	2. 200 408
Security Transformer 230 V	2.100 137
Security Transformer 115 V	2. 100 138
Network card	4. 150 044
Combo drive (optical + CD-ROM)	4. 150 034

Spare Parts

DESCRIPTION	PART NUMBER
MK 7-20C ECG amplifier	3. 222 3CC
Plastic connector isolation for MK 7-20	4. 435 109
MK 13-1 ECG processor board	3. 245 0CA
MK 13-3 rubber keypad (console)	3. 245 1AA
MK 13-4B connector board	3. 245 2BA
MK 13-5B relay board	3. 245 3BA
MK 13-6B power supply board	3. 245 4BD
MK 13-7B interface board	3. 245 5BA
PC main board CS-200	4. 150 023
SIMM module (RAM) 8 MB	4. 650 077
CPU Intel Pentium 120	4. 650 076
CPU ventilator	4. 330 025
Hard disk AT-IDE 2.1 GB	4. 150 024
Floppy drive 1.44 MB	4. 150 025
Graphic card PCI-VGA	4. 150 026
Mains transformer 80 VA / 2*115V / 2*11V	4. 320 067
Cabinet ventilator 12V CS-200	4. 330 024
12 V lead battery AT/SP10	4. 350 020
15" monitor CS-200	4. 150 028
17" monitor CS-200	4. 150 032
LCD monitor	TBA
CD-ROM drive CS-200	4. 150 027
Bus cable for CD-ROM	4. 520 424
DC power cable for CD-ROM	4. 520 402
Printer motor complete	4. 330 019
Thermal print head complete	3. 911 015
Thermal print head	4. 140 117
Printer cable	4. 520 398
Printer roller	4. 410 189
Paper mark sensor board MK 14-3B	3. 239 2BA
Paper tray	4. 310 160
Paper tray lid	4.310 161
Relay board cable	4. 520 401
HD / CD DC supply cable	4. 520 402
Floppy DC supply cable	4. 520 403

Spare Parts (cont.)

DESCRIPTION	PART NUMBER
PC main board power cable 1	4. 520 404
PC main board power cable 2	4. 520 405
Grounding cable	4. 520 408
Keyboard cable (console keyb.)	4. 520 409
ECG interface cable	4. 520 417
Extension cable stepping motor	4. 520 418
Connection cable 2 / 4 pol.	4. 520 419

Documentation

DESCRIPTION	PART NUMBER
User Guide CS-200; German	2. 510 211
User Guide CS-200; English	2. 510 212
User Guide CS-200; French	2. 510 213
Short-form Instruction Leaflet CS-200; German	TBA
Short-form Instruction Leaflet CS-200; English	TBA
Short-form Instruction Leaflet CS-200; French	TBA
Guide to the Schiller Measurements and Interpretation Programs E/D/F	2. 510 179

Software Options

DESCRIPTION	PART NUMBER
Software C	5. 030 003
SCHILLER ECG analysis program for - ECG measurements - average complexes and measurement markers - detailed measurement results table - interpretation statements	
Pacemaker measurement PM	5. 030 007
Extended Data Management Software SDS-200 a management and data storage and retrieval system for virtually unlimited storage. (From S/N 030.00504 standard) - Serial Comparison of ECG measurements - ECG validation and comments on screen - archiving - communication (e.g. modem transfer)	5. 030 006
EXEC analysis program for exercise ECGs - real time average complexes - real time ST analysis beat to beat - real time rhythm analysis - ST-HR trends - VES detection, rhythm classification - enlarged RS presentation - predefined protocols to control bicycle or treadmill - user defined protocols to control bicycle or treadmill	5. 030 004
EXEC Plus analysis program for exercise ECGs - 12 channel full disclosure of complete exercise test - re-analyse possibility of complete exercise test - parameter changes (e.g. J-point)	5. 030 005
SCHILLER 24-hour ECG Holter Software MT-200 - 2-channel recording and analysis - opto transmission cable Built-in AT card - operating manual	5. 030 011

Software Options (cont.)

DESCRIPTION		PART NUMBER
Late Potential analysis (available later)		TBA
RR variability analysis (available later)		TBA
Vector cardiography		TBA
Spirometry Module		TBA
BM-110 blood pressure measurement module (available later)		TBA
Remote control software pcANYWHERE		
German	Base version (1 remote and 1 host license)	2. 100 240
German	Host version (1 host license)	2. 100 241
English	Base version (1 remote and 1 host license)	2. 100 242
English	Host version (1 host license)	2. 100 243

Exercise Testing Accessories

DESCRIPTION	PART NUMBER
Standard Accessories Exercise ECG 3 - 10 lead patient cable clip with detachable leads - 30 disposable electrodes - pack of recording paper - ergo belt	2. 000 050
Exercise Bicycle 25-1000W including - non invasive blood pressure - measurement unit - interface cable	2. 210 024
Set of connecting cables bicycle - CS-200	2. 310 170
Trackmaster TM-400 Treadmill 220V, 50Hz including: - control via built-in RS-232 interface - emergency stop switch - speed range 0-5 - 10 mph (16 kph) - elevation 0-25% - interface cable	2. 210 008
Interface cable for TM-400/CS-200	2. 310 172
Ergo Belt	2. 100 060
SCHILLER BP-200 Blood Pressure Measuring Unit	2. 210 017
- Mounting Kit BP-200 to CS-200	2. 210 016
- Interface cable BP-200 to CS-200	2. 310 176

24-Hour ECG Holter Accessories

DESCRIPTION	PART NUMBER
Holter Kit MT-100	2. 100 550
including:	
- 2-channel solid state Holter recorder patient cable short	
- reusable carrying pouch	
- hook-up kit	
- user instruction leaflet	
Holter Hook up kit MT-100	2. 100 533
including:	
- alcohol preparation pads (2)	
- surgical razor	
- patient diary	
- batteries AA 1.5V, alkaline (2)	
- pre-gelled electrodes (5)	
- abrasive pad	
Patient Cable Short	2. 400 072
Patient Cable Long	2. 400 073
Reusable carrying pouch for MT-100	2. 156 025
H97 disposable Holter electrodes (35)	2. 155 045

Chapter 6
Technical Data

Contents

Standard System

Standard System	System cart with 2 drawers and four rolls	
	Emergency ECG capability thanks to uninterrupted internal power supply (battery) for minimum 3 minutes	
	Possibility to register ECG without starting the PC	
	RS-232 and parallel interface	
	DC-in/output	
	17" Monitor	
	QRS-trigger output	
	Ergometer interface (treadmill, bicycle)	
	Data management system for up to 200 recordings (including ECG validation and on-line editing). Newer units can manage an unlimited number of recordings.	
	SCHILLER resting ECG measurement program	
	Resting Rhythm registration	
	Pacemaker detection	
Interfaces	COM1, COM2:	PC, RS- 232 interface
	PRINTER	PC, parallel printer port
	BP	Blood pressure connector, RS-232
	ERGO	Ergo control connector, RS-232
	SPIRO	Schiller plug for connection of Spirometry sensor unit
	DATA I/O	ERGO control connector, analog
	DC IN	± 2.5V, 0.5V/cm, impedance >=100kOhm Maximum frequency 1.5kHz
	DC OUT	± 10V, 0.5V/cm, impedance <= 100Ohm, max. frequency 250 Hz
	GAS	Connection for a gas analyser, RS-232

Technical Data - System

Dimensions:	600 x 620 x 1530 mm;	23.6 x 24.4 x 60.1 ins
Weight:	c. 71 kg	c.162.7 lbs
Monitor:	Size: 17"	
	Type: color, low emission, high-resolution 1024 x 768 dots, 75Hz	
Operator interface:	Alphanumeric PC keyboard with integrated trackball	
	PC mouse	
	Direct function keys for Start/Stop/MAN/AUTO-ECG	
Power supply requirements:	115/230 VAC (nominal), 50/60 Hz	
Power consumption:	Max. 80 VA	
Battery	12V Lead acid rechargeable (built in charger); Bridging of power interruption (without monitor) of at least 3 minutes (ECG direct print possible)	
Processor:	PC: Pentium 75 / 120 MHz (or better)	
	RAM: 16 Mbytes (or more)	
	Operating system: WINDOWS 95™	
	Memory media: integrated harddisk > 2.1 Gbytes (or more)	
	Integrated floppy disk drive 3,5", 1.44 Mbytes	
Printing process:	Integrated high-resolution thermal printhead, 8 dots/mm / 200 dots /in (amplitude axis), 40 dots/mm / 1000 dots/in (time axis), @ 25 mm/s	
	Paper speeds: 5 / 10 / 12,5 / 25 / 50 mm/s (Manual)	
	Chart paper: thermoreactive, Z-folded, 8 1/2 in by 11 in (A4, letter size), app. 60m, ready-to-file	
	Frequency response of digital recorder: 0 Hz - 150 Hz (IEC/ AHA)	
	Channels: 6	
	Recording Tracks: 6 channels, positioned at optimal width on 200 mm / 8 1/2 in, automatic baseline adjustment	
	Sensitivities: 5 / 10 / 20 mm/mV, either automatically adjusted or manually selected	
External printer (optional):	Printout on normal paper with either laser printer or ink jet	

Technical Data - ECG Amplifier

ECG amplifier:	simultaneous, synchronous recording of all 8 active electrode signals (= 12 leads)
	sampling frequency: 4000 Hz
	digital resolution: 5 µV
	dynamic range: ± 10 mV AC
	max. electrode potential: ± 300 mV DC
	time constant: 3.2 s
	frequency response: 0.05 to 150 Hz (-3 dB)
	common mode rejection: > 100 dB / 50 or 60 Hz
	input impedance: > 100 MOhm
	pacemaker detection: ± 2 mV/ 0.1 ms
Filters:	Myogram filter **(muscle tremor filter)**: adjustable at 25 or 35 Hz programmable (not active on averaged waveform). Stored ECGs can be printed with or without filter. ECGs are always stored unfiltered.
	Line frequency filter: distortion-free suppression of superimposed 50 or 60 Hz sinusoidal interferences by adaptive digital filtering
	SSF SCHILLER Smoothing Filter: Low pass smoothing filter to supress high frequency noise for resting & exercise ECGs (no tangent to QRS complex itself)
	SBS SCHILLER Baseline Stabilizer: Filter to suppress or greatly reduce base line fluctuations without changing the measurement values
	Technical data is subject to change without notice

Certifications

	Designed to meet or exceed AAMI, UL, CSA and IEC-601 safety and performance specifications
Patient input:	Fully floating and isolated, defibrillation protected (only with original patient cable)
Patient leakage current:	< 5 µA
Safety standard:	CF according IEC 601-1 and IEC 601-2-25
	IEC 601-1-1 (Systems)
	EN 55011 (EMV Emission)
	IEC 801-1 (EMV Immunity)
Protection class:	I according IEC 601-1, with internal power supply
	IIa according RL 93/42/EEC
	Conformity: CE according 93/42/EEC
Environmental conditions:	Temperature, operating: 10° to 40°C / 50° to 104°F
	Temperature, storage: -10° to 55°C / 14°to 131° F
	Relative humidity, operating: 25 - 95 % (non-condensing)
	Pressure, operating: 700 - 1060 hPa

Chapter 7
Glossary

Contents

Introduction

The following list provides a glossary of the important signals and acronyms used in the circuit diagrams for the SCHILLER instruments. They will not all apply to the CS-200.

Only abbreviations that are specific to SCHILLER equipment are included here. General electrical and electronic abbreviations are not included.

Acronyms

..OS	Offset signal (on the ECG amplifier).
A(1...n)	CPU Address Bus
ALBEEP	Alarm beeper signal to the audio amplifier. The frequency of this signal is about 1000 Hz.
ANA1, ANA2	Analog input from the experimental inputs DC1 and DC2
AS	Address strobe
BATT	Signal to CPU indicating battery operation
BATTLC	Analog signal to the processor giving the charge condition of the battery.
BATTV	Battery voltage - analog signal from the power supply used by the processor to assess battery or mains operation.
BLOW	Battery less than 11.3 V. LCD flashes when this signal is acrive. When the battery drops to below approximately 9.4 V the unit is switched off. These values apply to equipment with 12 V battery. For other equipment the limits are different.
CHAD..	ECG signal multiplexer control signals (on the ECG amplifier).
CIF(0..16)	Communication interface. General control signals for the communications interface circuits.
CI(0..10)	RS interface control lines - input.
CO(0..10)	RS interface control lines - output.
CL1	19 kHz LCD latch pulse.
CL2	3.11 MHz LCD clock frequency.
CLK..	Clock signal. The number following the CLK indicates the frequency. For example CLK19 indicates a frequency of 19 MHz.
CS..	Chip select. The general format of the chip select signals is CS followed by some characters. The characters indicate the device to which the chip select signal appertains. For example CSRTC is the chip select signal for the real time clock and CSEPROM is the select signal for the EPROM etc.
CTS	Clear to send. General signal used in data communication.
D(0..15)	Data bus.
DACWR	Digital / analog converter write.
DMUX	Data multiplexer.
DRAM	Dynamic RAM.
DRC(0..6)	Dynamic RAM control.
DS..	Data strobe.
DSP..	Digital signal processor (on program pack).

Acronyms

DTACK	Transfer data acknowledge. Bus signal to acknowledge transfer of data.
DTR	Outgoing serial data, turns modem ON.
ECGI	ECG in - serial ECG data to the CPU sent over the optical interface.
ECGMUX	The multiplexed ECG signal from the ECG amplifier.
ECGO	ECG out - serial ECG amplifier control data from the CPU sent over the optical interface.
EF	Empty flag.
EJCT	Eject (paper tray).
EKGRES	Reset signal to the ECG amplifier. This signal resets the ECG amplifier to recenter the ECG image on the LCD.
FIFOR	First in first out read
FLM	Control signal for frame synchronisation of the LCD.
FPIN	Input for floating point co-processor.
FWR	Flag read / write.
HREN	Output enable signal for thermal print head data (History enable).
HSYNC	Horizontal synchronisation (video / VGA output).
IPL0..2	Interrupt priority level (binary encoded).
IREG	Control signal from the current detector and limiter circuit on the power supply to regulate supply.
ISYS	Interrupt system (2 kHz).
KB..	Keyboard data in.
KBBEEP	Keyboard beep (to audio amplifier).
KBCLR	Keyboard clear.
KBCL1	Keyboard clock.
KBCL2	Keyboard clock.
KBIN	Keyboard data in - serial data from the keyboard to the CPU.
KBS..	Keyboard strobe.
KONV	Convert - this signal initiates the conversion of the incoming signal from the ECG amplifier.
LA	Left arm.
LEDB	Battery LED.
LEDMAINS	Signal indicating mains connected to operate LED indicator on the keyboard.
LCA	Liquid crystal address - enable.

Acronyms

LCD KONT	LCD contrast - sets the -18 V voltage level (from which the LCD backlight power is generated) and thus the contrast of the screen.
LD1,2,3,4	Lower LCD data.
LDS	Lower data strobe.
LOE	Lower output enable.
LP	Line synchronisation.
LSRAM	Lower output enable - control signal for static RAM.
LWE	Lower write enable.
M	LCD control signal derived from FLM.
MCLK	Motor clock - speed control for the printer motor.
MOD	Control signal from the battery charging circuit.
MOFF	Motor off.
MON	Motor ON - printer motor enable signal.
NWTZ	Mains supply.
NMI	Non-maskable interrupt - interrupt for U47 (Schiller gate array) activated by the reset button.
OFF	Off signal from the OFF key to switch off the power supply.
PDS	Control signal derived from FLM (unity waveform 1/2 FLM frequency).
PM	Paper mark signal.
PMARK	Paper mard detection signal.
PMPON	Pacemaker detection pulse.
PMNEG	Pacemaker negative - indicates the trailing edge of a pacemaker pulse.
PMPOS	Pacemaker positive - indicates the leading edge of a pacemaker pulse.
QTRRG	QRS trigger - output signal.
RA	Right arm.
RAS	Row address strobe.
RES\p	Error reset signal to inactivate the LCD.
RTS	Ready to send - outgoing serial data, handshake with CTS.
RXD	Receive data - incoming serial data.
R / W	Read / Write
RES	Reset.
RESLCD/	Resets / darkens the LCD.
SC(0..8)	System control bus - CPU control signals

Acronyms

SCINV	Screen inversion.
SO	Serial output from the CPU to the ECG amplifier via opto isolators.
SP..	Spirometry control and data signals.
SRAM	Static RAM memory.
STRB1/2	Timing signals for printer control.
SYSEN	System enable - active when the Program Pack is inserted. The CPU will not work if this signal is not active.
TGATE	Gate pulse for programmable timer. This signal sets the TPDUR signal.
TM	Thermal printer temperature - dc voltage from the print head, pulse width modulation of signal TPTH.
TPC	Thermal printer clock. This is not a continuous clock signal but is active when loading a line of printer data (into shift registers).
TPCLK	Thermal printer clock.
TPD	Thermal printer data - serial data for the printer.
TPDUR	Thermal printer duration - duration of the strobe pulse dependant on the ambient temperature of the print head and the resistance of the print head.
TPCSEL	Thermal printer controller select - control of thermal printer FIFO (input memory buffer).
TPL	Thermal printer latch - print strobe control and data latch signal.
TPRES	Thermal printer reset - FIFO reset for thermal printer controller.
TPS 0 & 1	Thermal printer strobe.
TPTH	Thermal printer temperature - dc voltage from the print head to ADC, approximately 3.7 V at room temperature.
TS	Temperature sense (from battery).
TXD	Outgoing serial data.
uPOFF	Off control signal. Logic 1 keeps the unit switched on, logic 0 switches the unit off. Note that the unit is initially switched on directly from the ON key on the keyboard.
U1,2,3,4	Upper LCD data.
+UB	Battery voltage.
UCAS	Upper column address strobe (for dynamic RAM).
UD1, UD2	Upper data strobe - used for generating UOE and UWE.
UDS	Upper data strobe - used on the Schiller gate array.
UOE, USRAM	Upper output enable - for static RAM.

Acronyms

+UP	Voltage rectified from the mains input and regulated to approximately +15 V.
UWE	Upper write enable.
+U	Unregulated dc supply from mains (approximately 30V).
+UBU	Back-up voltage for the real time clock and static RAM.
+UD	Unswitched regulated dc voltage used as power source for the switched supply +US. The voltage is 13.5 V when mains is connected, or battery voltage when mains is not connected. When mains is connected, this supply charges the battery.
-ULCD	Contrast voltage to LCD.
+US	Input voltage for all PSUs on the power supply board from the rectified mains or from the battery.
VCC	+5 V
VMA	Valid memory address.
VPA	Valid peripheral address.
VSYNC	Vertical synchronisation - (video / VGA output).
WP0 and WP1	ECG in - the serial multiplexed ECG serial data to the CPU sent over the optical interface, from the ECG amplifier.
XD0..XD3	Pixel information.
XSCL	Shift clock for XDn.
YD	Frame synchronisation.
YDIS/	LCD off.
ZEROSET	Baseline reset (on the ECG amplifier) from the processor.